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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES' EQUIPMENT AND SUPPLIES ASSOCIATION.

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Forthcoming Events.

MAY 1.

Society of Chemical Industry (London Section):—"Recent Developments in Metallurgy," Paper by Prof. C. H. Desch.

Institute of British Foundrymen.

APRIL 21.

Sheffield and District Branch:—Annual general meeting at Sheffield. "The Technical Committee and Technical Developments in the Foundry Trade," Paper by J. R. Hyde and T. R. Walker.

APRIL 27.

Newcastle-upon-Tyne and District Branch:—Annual general meeting at Newcastle-upon-Tyne. Papers by competitors successful in the competition on January 25.

APRIL 29.

West Riding of Yorkshire Branch:—Annual general meeting at Technical College, Bradford.

Coal and Castings.—II.

We pointed out in a recent issue how, by careful study and investigation, power producers had been able during the past twenty years to reduce the amount of coal required for a given amount of power, and to utilise the cheaper grades of fuel.

Another aspect which has materially influenced the coal industry has been the enormous development of the gas and electrical industries, in which the production of these sources of heat, light and power is concentrated in huge central stations which are able to use fuel in the most efficient way, employing comparatively inferior grades. With the growing attempt to reduce the cost of coal as part of the cost of production there has come about a realisation that price is not the only thing to be considered in deciding what form of power to use. We think there will be great difficulty in persuading the small householder to go back to the coal fire instead of the gas fire or electric heater. Both are more expensive than coal burned directly, but the convenience of being able to turn a tap, or to switch off and on, is considerable. For various reasons, among which we must include the disastrous coal dispute, the use of imported oil has spread and tends to hold its field, in spite of price, on account of the ease of distribution.

Coming to the small consumer of coal, the purchase of coal in his view is open to the very great difficulty of ensuring that the material he receives is of the standard he wants and corresponds to the price he is asked to pay. Power stations and gas works offer an infinitely more standardised and uniform product, the quality of which is governed by legislation. A hopeful development, which has not in the main come from the coal industry itself is smokeless fuel, which will be welcomed by the makers of stoves for burning coke and anthracite.

The one thing which the new coal organisation does not appear to be doing is probably the only one through which the coal industry can ensure its regular progress, and that is by research, which will enable us to produce oils from coal, making us independent of foreign sources of supply; which will establish the hydrogenation of coal as a commercial success, and which will standardise the quality, size and ash content of coal that is purchased by the small consumer.

The foundry industry will find many parallels between the coal situation and the casting situation. For generations cast iron has been used almost instinctively as a form of construction which has ensured it an annual tonnage running into very large figures. It is now menaced by other forms of construction, some of which endeavour to offset the higher price by conveniences which justify this. The lines of progress appear to be the development of standardised, uniform and specified products, and of specialised lines to suit special purposes.

The Foundry Exhibition.

The International Foundry Trades' Exhibition, which opens next Monday at the Agricultural Hall, can lay no great claim to size, but we are prepared to state that it will be regarded in the future as a landmark in the history of the industry, because of the wealth of novelty shown in machines and materials. Governing the design of all the machinery exhibits shown is fitness to enter into a general scheme of internal transport, whilst for the raw materials there is invariably an intelligent recognition of the scientific progress which the industry has achieved in recent years. An effort has been made to correlate the utility of the diverse raw materials with the newer developments, embracing structural and analytical control, surface finish for after-treatment (enamelling and the like), and alloy additions.

Commercial conditions have so largely influenced the exhibition that the result is that about 80 per cent. of the machinery exhibits are shown for the first time; thus the exhibition has a minimum of dilution by apparatus which would under more favourable industrial conditions be shown for the purpose of "revision." After a close study of the exhibits and with all the responsibility which is attached to our position, we assert that there are more new machines, materials, and developments to be examined at this exhibition than at any we have had the privilege of describing since their inception in 1922. Their worth and novelty are such that no foundry executive can possibly afford to miss the opportunities made available by the exhibition for obtaining first-hand knowledge of developments designed to aid production. Finally, we would remind readers that cheap travelling facilities have been granted by the railway companies, and particulars of these, together with free admission tickets, will be sent to those writing to Messrs. F. W. Bridges & Sons, Limited, the organisers, at the Royal Agricultural Hall, Islington, London, N.

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

The Heat Reactions Involved in the Treatment of Cast Iron with Soda Ash.

To the Editor of The Foundry Trade Journal.

Sir,—The article by Mr. Fletcher on this subject which appeared in your issue of April 6 is extremely valuable in that, perhaps for the first time in published literature, the relative importance of the sulphur and silicon losses are brought into proper perspective. Desiliconising rather than desulphurising would appear to be a more appropriate description of the process of treating cast iron with soda ash. The losses of silicon are of considerable practical importance, and particularly in the case of low-silicon irons and irons for malleable castings neglect to make due allowance for this loss may have unfortunate consequences. I am afraid that other writers on this subject have not given this aspect of the matter the emphasis which it deserves.

I have for many years held the opinion that the elimination of sulphur and silicon are interdependent reactions, the silicon playing the part of a reducing agent, setting free sodium in a nascent condition, and that it is this nascent sodium which combines with the sulphur, probably in the manner suggested by the following equation:—

$$2Mn\,[S + 2Na_2]\,[O + Si] \rightarrow 2Mn + 2Na_2O + SiO_2$$

If this proposition be correct, then Mr. Fletcher has made a fundamental error in his thermal calculations, as he has credited the exothermic side of his balance sheet with the total heat which would be evolved if the silicon were oxidised by free oxygen. When the volume of air which would have to be brought into intimate contact with the vigorously-reacting metal and slag is realised, the absurdity of free oxygen being responsible for the silicon loss is at once apparent. A rough calculation shows the necessary volume of air to be about 40 times the volume of metal in the case of the loss of 0.15 per cent. silicon, measuring the air at N.T.P. It is scarcely credible therefore that free oxygen can be responsible for the silicon loss and Mr. Fletcher's estimate of the exothermic reactions must be too high by the heat of formation of the oxygen-yielding compound.

There are two possible sources of oxygen, viz., Na_2O and CO_2, and the exothermic balance of the resulting reactions will be:—

$$2Na_2O + Si = 4Na + SiO_2 + 6{,}127 \text{ B.T.U. per lb. silicon.}$$

$$2CO_2 + Si = SiO_2 + CO + 3{,}914 \text{ B.T.U. per lb. silicon.}$$

The elimination of sulphur will be as follows:—

$$2Na + S = Na_2S + 5{,}030 \text{ B.T.U. per lb. sulphur.}$$

These three equations summarise the main exothermic reactions which will take place in such a manner that the heat generated can be absorbed by the metal. There are undoubtedly small quantities of iron and manganese oxidised, the oxides passing into the slag. Assuming that Mn and Fe are oxidised by Na_2O, the amounts of heat generated are so small as to be negligible. In the cupola it may be assumed that the silicon will be oxidised by Na_2O, but in the ladle it seems impossible to determine how much silicon may have been oxidised by CO_2 and Na_2O respectively, so that one can only give maximum and minimum figures for the heat generated in the ladle method and say that the actual figure lies between the two. Applying the figures in the equations to the case quoted by Mr. Fletcher, where 0.04 lb. and 0.15 lb. Si are eliminated from 100 lbs. of metal, we have on the exothermic side of the balance sheet, assuming that all the silicon is oxidised by Na_2O,

0.15 lb. silicon at 6,127 B.T.U. per lb.	919 B.T.U.
0.04 lb. sulphur at 5,030 B.T.U. per lb.	201 B.T.U.
Due to combination of silica and soda	455 B.T.U.
A total exothermic output of..	1,575 B.T.U.

Assuming CO_2 as the oxidising agent, the total exothermic output is only 1,243 B.T.U. per 100 lbs. metal.

Applying these figures to the ladle method, it will be seen that even if all the silicon is oxidised, there is only an exothermic balance of 1,575 less 1,280 B.T.U. after deducting the heat absorbed by CO_2, and against this balance of 295 B.T.U. there has to be debited the heat necessary to raise the soda ash to the temperature of the metal, so that the net result will be a small endothermic balance. It is certain that it cannot be large, and offsetting it to some extent is the fact that the dissipation of heat will be retarded by the blanketing effect of the slag, and the exothermic reactions which take place in the flame. I cannot agree with the principle that Mr. Fletcher has adopted in assuming that all the heat generated in the flame reactions will be absorbed by the metal in the ladle. My opinion is that the flame reactions will consist of the reoxidation of that part of the nascent sodium, produced by the reducing action of silicon, which has not been combined with sulphur, together with the oxidation of any CO produced. If this view be accepted, then the total exothermic output cannot exceed the heat which would be generated if the silicon were oxidised by free oxygen, *i.e.*, 12,600 B.T.U. per lb. silicon, and, further, it seems reasonable to credit the metal with only the heat generated by the primary reactions, and not reasonable to assume that the heat generated during the secondary or flame reactions will be so absorbed.

So far as the cupola method is concerned, I think it is safe to assume that the metal will reap the full benefit of the 6,127 B.T.U. per lb. Si oxidised and some partial benefit will be experienced as a result of the 12,600 minus 6,127 B.T.U. generated later as a result of the oxidation of Na which has not combined with sulphur.

My main conclusions are that Mr. Fletcher's estimates of heat production are too high, and that in the case of ladle additions the reactions are slightly endothermic, so far as their effect on the metal is concerned, whilst in the case of the cupola the exothermic balance is only possibly half that calculated by Mr. Fletcher.

There is one point noted by Mr. Fletcher which I consider deserves special comment and emphasis in view of the fact that the use of soda-ash blocks is being recommended to malleable foundries. He observes that the silicon loss is 50 per cent. greater than with the ladle method. Silicon control being such a decisive factor in successful malleable production, it is important that this observation should be carefully considered and its significance appreciated.—Yours, etc.,

J. K. Smithson.

Stillington, Stockton-on-Tees.
April 12, 1933.

High-Chromium Cast Iron.—Cast iron containing 15 per cent. chromium is being used increasingly where resistance to oxidation and abrasion at high temperatures is required. Stoker bars of this alloy have been in service for six months without signs of oxidation. Automobile brake drums of this alloy also promise success. In castings of comparatively heavy section, where brittleness is not objectionable, cupola iron with carbon as high as 3.5 per cent. can be used. For thinner sections, it is desirable to have a lower carbon content, which in some cases necessitates the use of the electric furnace in producing this alloy.—"Steel."

Random Shots.

I must confess that when I embarked on the question of the correct spelling of "ferrous" I failed to realise that beneath the veneer of the foundryman lurks the grammarian's passionate desire for pure English. The spelling of "ferrous" has now been finally settled. Correspondents agree that the form "ferreous" is archaic. But, apparently, while daintily leading my readers past the shifting sands of "ferreous," I have put my own foot in a quagmire.

* * *

A correspondent points out that recently I used the term "sleeping draft" instead of "sleeping draught." Here, I admit, I was wrong. Fowler's "Modern English Usage" deals with the matter as follows:—"draft, draught, etc. *Draft* is merely a phonetic spelling of *draught*, but some differentiation has taken place. *Draft* has ousted *draught* in banking, and to a great extent in the military sense *detach(ment)*; it is also usual in the sense (*make*) *rough copy* or *plan* (a good *draftsman* is one who drafts Bills well, a good *draughtsman* one who draws well). In all other common senses (game of *dd.*, air-current, ship's displacement, *beer on d.*, *beast of d.*, haul of fish, dose, liquor), *draught* is still the only recognized British form; in U.S. *draft* is much more widely used." Note the last sentence particularly. The joke in which the "sleeping draft" was mentioned was a direct import from America, and was, unfortunately, printed in its original form. If I had only "bought British" the mistake would never have occurred.

* * *

Somebody or other once said that there are only half a dozen original jokes in currency, of which all the jokes in the comic papers are mere variations. Nevertheless, a large proportion of "new" jokes seem to emanate from America, and they are very often repeated and printed in their raw state. In fact, an American accent is part of the stage property of many a comedian, particularly of the "wisecrack" variety whom we so often hear across the ether. Therein lies my excuse for using the word "draft." If Broadcasting House, that fount of excessively "refained" English, condones Americanism in humour, why should I, a humble marksman, be pedantic when I crack an occasional American chestnut?

* * *

Things looked very busy at the office of Messrs. Solomon & Cohen. For three days the partners had been poring over books and feverishly adding up columns of figures. Then, at the end of it all, a wail of despair escaped the lips of Mr. Solomon.

"Ach, Cohen," he cried, "vot a vaste, vot a vaste! Ve have given the bookkeeper a veek's holiday and his books vas right after all!"

* * *

A farmer was trying to fill in a claim sheet for damages inflicted by the railway company. His cow had been killed, and in filling up the blank form all went well until he came to the question: "Disposition of the carcase."

He puzzled for a time, and then put: "Kind and gentle."

Marksman.

The International Foundry Trades' Exhibition.

A WEALTH OF NOVEL EXHIBITS.

This exhibition, which opens next Monday at the Agricultural Hall, Islington, London, is not so large as on previous occasions, but because of the vast strides made in foundry equipment in recent years, the machinery shown is new. We are prepared to state that never at any foundry exhibition has there been such a wealth of entirely new designs. Practically every machine shown has been evolved with one eye on transport. The old-fashioned moulding machine merely converted a sand puncher into a porter. The models shown at the exhibition are all designed to fit properly into production methods. Sand preparation is represented by several entirely new models, and shows a distinct advance upon most of the types shown in previous years.

Pig-iron has never before been so intelligently displayed, and the collection of samples and data available at the Agricultural Hall has certainly never been equalled in any exhibition either at home or abroad. The raw materials available for the foundry are almost bewildering in their number and variety. With the advent of alloy cast iron the developments of sulphur reduction, briquettes for aiding compositional control and adaptations of melting methods have discovered for themselves places as aids to its production. For instance, the crucible furnace once again finds a niche in the iron foundry. Scientific instruments, too, are well represented, and they, too, have adapted themselves to the practical requirements of the industry. Refractories are shown by several firms and the progress achieved is mainly in the direction of the publication of reliable test data. In previous years foundrymen had to find by experiment just what suited them. To-day they can get a fair approximation before testing. This is true of bricks, plastic material, sands and facings. The highest temperature resisting refractories and insulating materials will command the attention of most as showing great potential economies.

Whilst the show is certainly smaller, no phase of foundry practice has been omitted, and, unlike most exhibitions, the majority of the stands have something really new to show to the industry. This is due in no small measure to the incidence of tariffs and the gold standard, which has caused the manufacturing of plant to be transferred from the Continent to Britain. This transference has brought about not only redesigning but also true invention. We have given more attention to the exhibits in general than perhaps any other person in the land, and from this examination we urge every foundry owner and director to visit the exhibition accompanied by his managers, foremen and metallurgists, and if at all possible the actual moulders and coremakers.

Following we describe in detail the various exhibits on the individual stands.

Pig-Iron.

Sir W. G. Armstrong, Whitworth (Iron-founders), Limited, Close Works, Gateshead.—This firm's exhibit comprises a series of castings of various analyses which have been machined and sectioned to show conclusively the toughness and freedom from porosity of "New process" refined iron. In addition specimens of the complete range of refined pig-irons will be displayed upon a specially-designed pyramid-shaped stand which will provide simple and easy comparison of the various grades of pig.

William Baird & Company, Limited, 168, West George Street, Glasgow, have on their stand small stacks of their various grades of "Gartsherrie" and "Eglinton" Scotch foundry pig-irons, and two cases showing the fracture of the different qualities of these pig-irons. Being large manufacturers of foundry coke, etc., they are exhibiting a series of different samples.

Not only can all of the analyses be varied to suit buyers' specifications, but stock lists are prepared from time to time which show that in addition to their standard qualities they also supply pig-iron with silicon from 1 to 4 per cent., phosphorus from 0.10 to 0.70 per cent. or even higher if required, and manganese from 0.80 to 1.80 per cent. In addition, hematite, basic, forge and cylinder irons are regularly made together with special analyses to buyer's specification where the quantities are reasonably large.

	A.	B.	C.	D.	E.	F.	G.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
T.C.	3.20	3.20	2.00	2.75	3.50	3.00	3.00
Si	0.60	1.20	1.00	1.75	1.35	2.75	4.00
S	0.05	0.04	0.04	0.04	0.04	0.05	0.05
P	0.05	0.05	0.05	0.25	0.50	0.05	0.05
Mn	0.25	0.25	0.80	1.00	0.80	1.20	0.75
Cr	—	—	—	1.00	—	2.50	—

Mr. D. H. Wood.
(President, Foundry Trades' Equipment and Supplies Association.)

"Gartsherrie" Brand Scotch Foundry Pig-Iron.

	No. 1.	No. 3, soft.	No. 3, firm.	No. 4.
Gr ..	3.25	3.15	3.00	2.80
C ..	0.30	0.35	0.40	0.50
Si ..	3.25	2.75	2.25	1.50
Mn ..	1.00	1.00	1.00	1.00
S ..	0.025	0.035	0.045	0.09
P ..	0.55	0.55	0.55	0.55

"Eglinton" Brand Scotch Foundry Pig-Iron.

	No. 1.	No. 3, soft.	No. 3, firm.	No. 4.
Gr ..	3.30	3.15	3.00	2.85
C ..	0.25	0.35	0.40	0.50
Si ..	3.10	2.60	2.10	1.75
Mn ..	1.20	1.20	1.20	1.20
S ..	0.025	0.035	0.050	0.085
P ..	0.60	0.60	0.60	0.60

Barrow Hæmatite Steel Company, Limited, Barrow-in-Furness, Lancashire, have hematite pig-iron as their principal exhibit. Its standard compositional range is:—Total carbon, 4.00 per cent. approx.; silicon, 1.00 to 4.00 per cent. in 0.50 per cent. limits; sulphur, 0.02 per cent. max.; phosphorus, 0.020 max. to 0.035 per cent. max. in 0.005 per cent. limits; and manganese, 0.25 per cent. max. to 2.00 per cent. as required. It is the firm's practice to issue a stock list once per month, but they prefer to manufacture iron to customers' specification. The hematite pig-iron is shown as samples to indicate fracture and nature of the pig, together with corresponding photographs.

There is also on exhibit B.H.R. superheated refined pig-iron, for use in malleable, cylinder, roll and heavy-duty castings foundries where higher strength, freedom from porosity, resistance to distortion and pressure and high machinability are essential. This iron is manufactured from hematite pig-iron without the addition of steel or iron scrap, and is made to buyers' specifications. Typical analyses of this material are set out in the above table.

It is interesting to note that nickel, chromium, manganese, silicon, phosphorus and vanadium content are adjusted to buyers' requirements, whilst soda ash or titanium-treated irons are also included in the range.

Bradley & Foster, Limited, Darlaston Blast Furnaces, Darlaston.—This exhibit consists of a comprehensive range of samples of refined pig-iron. It is divided into four main groups:—(1) Blended All-Mine pig-iron; degasified cylinder pig-iron; refined alloy pig-iron; and refined malleable pig-iron.

The blended All-Mine quality is produced by a careful selection of materials on a basis of mechanical strength properties. By special methods it is possible to make this iron with known and regular physical strength to match any required tests.

The degasified cylinder iron is produced by Bradley's patent process of stirring and agitating the molten metal whilst in the receiver in order to ensure a completely homogeneous mixture free from gases and slag particles. Sound castings of high strength are obtainable with the use of this iron.

The alloy irons include a wide range of qualities from low nickel-chrome irons for direct use up to various types of austenitic ingots. Several of these are on view for the first time, and are of very great interest to foundrymen who receive inquiries for castings of special composition or to specified mechanical tests.

A complete range of fractures of refined malleable pig-iron is on view and serves to demonstrate the elaborate system of grading employed at these works. The firm emphasise their offer of free technical service and advice on all matters related to metal mixtures. It maintains a technical staff which is in constant touch with customers and helping to solve their problems.

It is highly probable that never previously has such a wide range of pig-iron samples been exhibited either in this country or abroad.

In addition to a number of standard composition range pig-irons, the firm also makes a speciality of manufacturing to customers' specifications. The exhibit is confined almost exclusively to small cut-off sample fractures. The personnel on the stand will include Mr. G. T. Lunt, managing director; Mr. J. E. Hurst, technical director; Mr. G. W. Taylor, Mr. L. Whitehouse and Mr. R. A. Stiles.

British Pigirons, Limited, Abbey House, 2, Victoria Street, London, S.W.1, are exhibiting a composite range showing fractures of the well-known "Midhill" and "Glenhill" Allmine special pig-irons. These grades, which are standardised in a large majority of the leading foundries throughout Great Britain and the Continent, are supplied in the following qualities:—Cold blast, cylinder, toughening and special foundry. They are produced by an associated company at Scunthorpe, Lincs, and are manufactured by cold blast, warm blast and hot blast, under their respective qualities. The above brands are produced within very wide limits, or to customers' requirements, and the analysis of each delivery is guaranteed. Full microphotographs will be exhibited together with various machined samples, chilled test-pieces, literature, etc. The stand will be staffed as follows:—Mr. G. B. Taverner, managing director; Mr. E. C. O'Brien, general sales representative; and Mr. I. H. Baker, Midlands representative. During the Exhibition it is anticipated that the firm's Belgian, Italian and Dutch representatives will also assist.

Colvilles, Limited, of 195, West George Street, Glasgow, C.2, are displaying samples of Dalzell, Glengarnock, Clyde and Monkland foundry qualities of pig-iron, Clyde special and ordinary hematite and Dalzell special refined in the form of pigs as cast, whilst a series of fractures of No. 3 Clyde, No. 3 Glengarnock, No. 3 Dalzell special low-phosphorus, Dalzell No. 4 close cylinder, No. 1 Monkland foundry qualities and Clyde ordinary and special hematite are available for inspection.

Several specimens of castings are on view which have been made from mixtures of Dalzell special refined pig-iron, the special feature of which is its low total-carbon content, this being 3 per cent. maximum. These specimens show the high quality of the castings obtained by the use of this iron. All the irons shown are hot-blast irons, with the exception of Dalzell special refined, which is a specially-manufactured product.

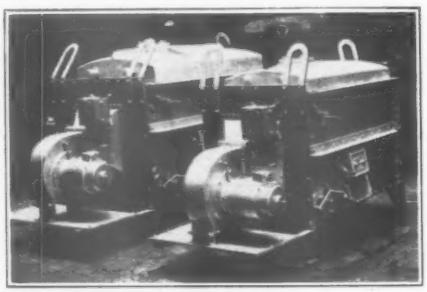
Whilst Colvilles have their own standard compositional ranges, they are prepared to make to customers' specifications whenever possible.

Stewarts and Lloyds, Limited, of Winchester House, Old Broad Street, London, E.C.2, and elsewhere, have had the co-operation of users of the irons for demonstrating the usefulness for light castings, and the ability to enamel satisfactorily their pig-irons. Naturally there are available for inspection samples of foundry, forge, basic and special irons, covered by S.V.H., Lloyds and Islip brands. It is interesting to note that these cover a range of from 1 to 5 per cent. silicon; 0.01 to 0.05 sulphur; 0.3 to 1.4 manganese and 0.6 to 1.5 per cent. phosphorus. Lists of the compositions and quantities in stock are available and on the customer not finding therein just the composition he seeks, it can be made to specification providing the quantities required are sufficient to warrant the changing of the burden.

In addition to pig-iron samples of both raw and calcined Northamptonshire ironstone; magnesian and white limestone; Lowick ganister and slag are shown. Castings made by L.M.S. Railway Company; Allied Iron Foundry; Sidney Flavel & Company, Limited (Leamington); Cardiff Foundry and Engineering Company, Limited; Crane, Limited (Ipswich); Revo Foundry Company, Limited (Tipton); Walter MacFarlane & Company (Glasgow) and E. N. Wright & Company, Limited, are being shown and include porcelain-enamelled baths, cooking ranges; gutters and fall pipes; enamelled wash basins; traffic-control columns; electrical castings chairs; axleboxes and gear wheels.

Sand Preparation.

August's, Limited, of Thorn Tree Works, Halifax, are occupying two separate stands (C. 8 and 9), one of which is devoted to working demonstrations of the Simpson intensive sand mixer and the August's Borrmann core-making machine. The other stand is fitted up as a cinema in which at frequent periods during the exhibition films of August's foundry installations



Portable Core-Drying Stoves by August's, Limited.

are being shown. Also on the latter stand are exhibited August's portable mould driers and August's portable core stoves and the laboratory-size Simpson mixer.

On the working exhibit stand a No. 2 size Simpson intensive sand mixer, complete with a bucket loader, August's bye-pass aerator, all direct driven through reduction gearing, will be in frequent operation, showing the mixing of facing sand, core sand, loam and the re-conditioning of backing sand. This mixer is fitted with a steel platform to enable visitors to get a close view of the actual mixer itself. The No. 2 size Simpson Intensive Sand Mixer has a 6-ft. dia. pan, and is capable of a charge of 6 to 8 cwts. of sand per mix. This machine mixes with equal facility facing sand, oil sand, loam, or re-conditioned backing sand, but, of course, its capacity in terms of sand mixed per hour is dependent upon the type of sand being mixed. On facing sand this machine will give an output of 4 to 5 tons per hour. It is driven by a 15-h.p. motor which, through reduction gearing,

Core-Drying Stoves by August's, Limited.

operates not only the sand mixer itself, but also the accompanying bucket loader and aerator. One man operates this machine and is all the labour required to produce the output of sand stated. The small amount of labour for the production of so large a quantity of sand is accomplished by means of the labour-saving bucket-loading device and the automatic aerator. In operation the machine is charged with the requisite charge of sand at floor level into the bucket of the loader. It is important to realise that there is no preliminary mixing of the raw sands, these being just charged into the bucket. The mixer is then loaded, water is added in the mixer in definitely regulated quantities and after the mixing the operator merely opens a door in the floor of the pan, permitting the action of the mixer itself to discharge its contents directly on to the August's aerator and through that into the wheel-barrow or crane tub. It will thus be seen that the labour involved is merely that of charging the quantity of raw sand into the bucket at floor level and the subsequent operation of levers. The minimum amount of labour usage is claimed for this machine, together with a considerable reduction in the amount of new sand required, also a very large output of all types of sand.

On the same stand is shown a No. 2A size August's Borrmann core-making machine fitted with the August's patented blowing slide device. This machine is also fitted with an

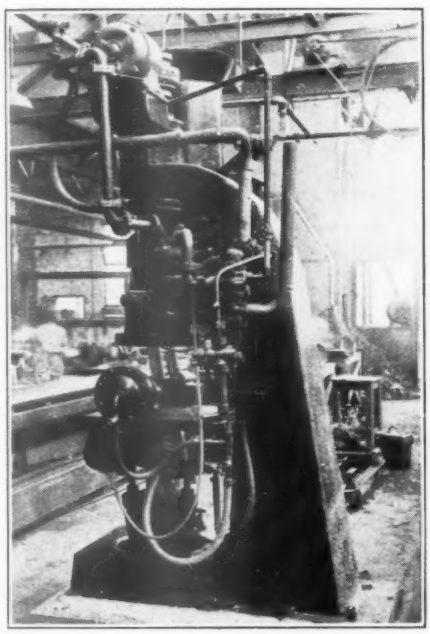
Simpson Bucket-Loaded Intensive Mixer by August's, Limited.

August's bucket-loader to charge the core sand into the sand container on the machine. This bucket loader is identical in principle to that operating on the No. 2 Simpson mixer. This machine is producing at frequent intervals during the exhibition, cores just as on production in a foundry. Visitors will be able to see intricate cores being produced on quantity production lines by the machine. Production of cores weighing from 20 to 40 lbs. of intricate designs in a complete production cycle of 10 or 15 secs. per core will be shown. The operation of this core-making machine is simplicity itself, and on the production, particularly of small cores, the operation requires merely the placing of the core box on the table of the machine and the moving of one lever which causes a sequence of operations to take place, after which the blown core is removed for stripping. This machine will be shown in operation on a variety of types and sizes of cores in metal and in wooden boxes and being produced in both oil sand and naturally-bonded sand.

On the other stand a cinema capable of accommodating 40 people is in use. Here at frequent intervals during the day there are being exhibited films taken within the past six months illustrating August's core- and mould-drying equipment, August's composite sand plant, August's mechanised foundry equipment and a typical August's continuous casting system. Also on this stand there is an A2-type August's portable core

stove. This unit, having four drawers, each 6 in. deep, 4 ft. long by 2 ft. 4 in. wide, has a remarkably low fuel consumption of from 3 to 5 cwts. of ordinary gas coke per week. Also, there is shown the No. 1 and No. 3 sizes of August's portable mould drier. These units are two of the range of August's portable mould driers, large numbers of which are in use in foundries throughout this country for the site drying of large moulds. There are some hundreds of these portable core stoves and mould driers in use, and the units exhibited on this stand will be complete and ready for operation.

Additionally there is a laboratory Simpson sand mixer in operation. This small unit is very



The August Borrmann Core-Blowing Machine by August's, Limited.

popular for sand-testing laboratories and for experimental work on moulding sand. Quite a number of these are in use in this country, giving excellent service. Finally, there are large-scale illustrations of August's plant and units, and also a large exhibition of typical cores being produced on the August's Borrmann core-making machine. Both Mr. H. F. Coggan and Mr. C. E. France expect to be available on most days during the run of the exhibition.

Refractories.

The Carborundum Company, Limited, Trafford Park, Manchester, are displaying a range of carborundum refractories, including Carbofrax and Alfrax bricks, tiles, special shapes, tubes and muffles. Carborundum crucibles are designed for use in the non-ferrous metal-melting industry. These crucibles possess many advantages, such as long life, no annealing treatment required (they do not absorb moisture), withstand the highest furnace temperatures, and are not affected by being cooled between heats.

Carbofrax and Alfrax enamelling muffles have the advantage of longer life with lower fuel consumption, giving increased production at lower fuel costs, better-burned ware, with more uniform distribution of heat. Carbofrax and Alfrax hearth tiles, when used for heat-treatment furnaces, will withstand the trying condition of handling heavy articles, as they show remarkable resistance to abrasion and will not soften or sag. For setting these, Carbofrax and Alfrax cements must be used to obtain the maximum benefit.

Carborundum is a super-refractory material, and when bonded with suitable binder and made into brick and special shapes it is known as Carbofrax, and possesses great refractory value. Carborundum being produced in the intense heat of the electric furnace, it cannot be melted; it possesses an extremely low coefficient of expansion coupled with high thermal conductivity, and will withstand the highest temperatures, resist abrasion and does not spall or crack under rapid changes of temperature. Its great value in the upkeep of high-temperature furnaces is definitely established.

Alfrax bricks are principally composed of electrically-fused alumina.

Wm. Cumming & Company, Limited.—This well-known firm of foundry facings manufacturers and general foundry furnishers, whose head office is at Maryhill, Glasgow, and who have branches at Chesterfield, Falkirk, Deepfields and Middlesbrough, are on this occasion showing samples of every facing which they manufacture, and it is somewhat surprising to find that there is such a wide range to choose from. It is scarcely believable that blackings, apparently looking alike, should be so widely divergent in their analyses and physical properties, and afford such different results in their application.

The development of this side of the business owes quite a lot to Messrs. Cumming & Company, whose researches have been carried out for many years, and whose various products have frequently been the result of suggestions from practical men, backed by practical experiments in foundries of various descriptions. In their own laboratories, which are certainly well-equipped, Messrs. Cumming seem to be continually experimenting with the object of improving the various grades, and thus assisting to relieve the founder of anxiety so far as this side of his business is concerned.

The grinding of the various materials seems to have been reduced to a fine art, literally as well as figuratively, for the latest product, which is numbered 30 X, is about as fine a product as one could possibly imagine.

The heavy blackings manufactured by this firm, which are on show, certainly leave nothing in the way of heat resistance, while the finer grades, for use in hollow-ware and such like, seem to be beautifully blended and are extremely attractive in the soft silkiness of their texture.

As usual, the firm are showing some fine samples of pure plumbagos, which have been imported by them direct from Ceylon, and the quality of which may be said to challenge the world. Users of such an article should certainly pay a visit to the stand, where will be found practical men quite ready and able to discuss the various products from the user's point of view as well as from that of the salesman.

In addition to various furnishings, Messrs. Cumming this year are showing a new portable furnace, quite a number of which have already been sold and are giving satisfaction. As a result of the publicity obtained through the exhibition, Messrs. Cumming hope that many more of these will be distributed throughout this and other countries, for already inquiries are coming in from abroad. For portability, simplicity, economy and adaptability this furnace is certainly well in the forefront, and the makers assure customers that the claims that are made for it are well under its actual capacity. Demonstrations are being made in a foundry within easy reach of the hall, and visitors are invited to witness these at any convenient time.

General Refractories, Limited, Genefrax House, Wicker Arches, Sheffield, as manufacturers of refractory materials of all types, are exhibiting a wide range of refractory bricks, cements, sands and compositions. Specimen bricks and shapes are shown of acid, basic and neutral character. Mention may be made especially of silica, hylumina, magnesia, sillimanite and diazite bricks. The last product is a new development of this company, being composed of a highly refractory chrome-alumina-magnesia spinel. Diazite bricks are used as a substitute for magnesite bricks in the linings of basic open-hearth steel furnaces and also as a hearth lining for reheating furnaces, soaking pits, etc. The display includes cupola linings and fireclay bricks of various types. Ganisters and improved cupola patching and lining compositions are exhibited, the potentialities of Plasstick and Glendoline being particularly stressed.

During recent years, General Refractories, Limited, have added largely to their resources of steel moulding sand and iron and brass moulding sands. Standard grades of Yorkshire steel moulding sand are produced in various parts of the country, and grades are produced for both green-sand and dry-sand work. As Yorkshire sand is a synthetic nature, perfect standardisation of the high quality is maintained.

Specimens are shown of the many varieties of iron and brass moulding sands produced, including Bramcote, silica, maximum and minimum core, York yellow, Red Rover, Zenith and Crystal Core sands. Of these, special mention may be made of various synthetic mixtures now produced in York yellow sand. Grades of various bond strength may now be supplied, from the lightly-bonded York yellow No. 103 sand to the heavily-bonded York yellow No. 102 sand, used mostly in small quantities as a sand reviver.

Demonstrations are made of the properties of refractory cements and concretes produced by this company. Among these are Pyrolyte, Amoroc, Durax refractory concrete, silica paints, moulders' compositions and parting powders are also exhibited.

The following are in attendance at the stand: Messrs. Frank Russell, R. A. Kirkby, George Senior, O. Wass, A. C. Turner, J. W. Wallis, T. Watson, E. Greaves, R. J. Blakey, F. C. Colls, P. W. Hood-Williams.

Thomas E. Gray & Company, Limited, 119, High Holborn, London, W.C.1.—This firm's exhibit comprises a small "British Herrmann" furnace fitted with a No. 4 heat accumulator for the drying-out of cores and moulds. Attention is directed to the unique features of this furnace, namely, the heat accumulator and the specially-designed tuyere-type firebars which permit the combustion of the lowest grades of fuel such as coke refuse, unwashed coke breeze, coke dust and the like. The accumulator, constructed of "Silacene" brand firebricks, is interposed between the firebox and the drying chamber and is so constructed that it offers to the hot gases emitted from the firebox an extremely large area for the rapid absorption of heat whilst at the same time providing a heavy mass of masonry for its retention. The heat so retained is gradually and constantly given up over a reasonable working period after the fire has burned out. An even temperature is obtained throughout by the setting up of a static pressure in the drying chamber and large volumes of superheated air are circulated continuously around the core and moulds, rapidly absorbing the evaporated moisture and escaping through scientifically-dimensioned outlets.

The operation of this system is simplicity itself. After two or three hours the fan is shut off and the stove requires no further attention, the accumulator maintaining the temperature necessary to complete the perfect drying. Fig. 1 shows some heavy roll moulds which are being perfectly dried out in 12 hours at a cost of only 2s. 10d. for fuel and 2s. 11d. for labour (inclusive of firing and cleaning).

Messrs. Gray state that in every installation the economies effected by those firms having adopted the system have been such as to repay the whole cost of conversion in approximately 12 months. It is thus worthy of close investigation.

Visitors will also be interested in noting the efficiency of the "Eesirun" bogie, a model of which is being displayed. (See also Fig. 1.)

Thomas E. Gray & Company, Limited, also specialise in the manufacture of their renowned

"Silacene" plastic refractory, and samples of this product are being shown. "Silacene" is prepared in numerous grades according to the consumer's requirements and is in daily use at the largest steelworks and ironfoundries for setting, patching and ramming. It is eminently suitable for cupolas, rotary furnaces, O.H. steel furnaces, soaking pits, converters, ladles (iron and steel), non-ferrous pit fires and tilting furnaces, etc., etc.

We understand that this firm has been very active for some time now in the evolution of a British lining for the Brackelsberg and Sesci types of rotary furnace and that as a result they are in a position to offer a satisfactory product for this purpose. Visitors interested in this modern type of furnace should make a point of discussing any lining problems on the spot.

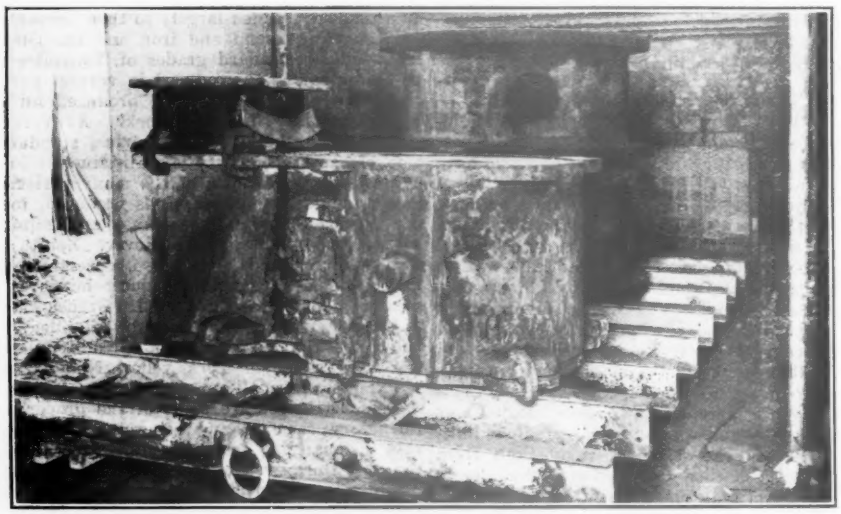


Fig. 1.—Heavy Roll Moulds dried in a Herrmann Stove. Thomas E. Gray & Company, Limited.

There are now some hundreds of cupolas being operated in this country with rammed linings of "Silacene," and unquestionably this lining shows distinct economies and advantages over the use of firebrick.

Other specialities prepared by Messrs. Gray include "Ferocem" metallic cement, "Ferromol" desulphuriser, "Dust-on" parting powders, "Clariflux," and they also exploit the "Poumay" system of cupola control by the use of which coke economies of between 20 and 50 per cent. are made possible.

Charles Hearson & Company, Limited, 27, Mortimer Street, London, W.1 (Telephone: Museum 2239), sole agents for Great Britain for Reichert Metallurgical Microscopes, are exhibiting several of this latter firm's well-known metallurgical products. A first appearance in this country of the Reichert universal microscope MeF will have special interest for the metallurgist. This equipment is primarily a bench instrument, compact and with all accessories, conveniently placed and accessible for quick operation. It provides both for direct observation and photo-micrography and, with ingenious and practical optical devices, permits examination of the specimen under various light conditions—transmitted, polarised, oblique, opaque vertical, and with either dark ground or light field.

In general construction, the hall-mark of Reichert precision, workmanship, ingenuity of mechanical design and optical excellence is all apparent and in keeping with the world-wide reputation which Reichert instruments have established in the metallurgical world. The MeF is not a challenge to the Reichert large metallurgical equipment EM1—which is also being exhibited—but it appeals to the small works laboratory and the technical institute, where expense has to be considered, as the MeF outfit will cover not only the requirements of general routine, but also those of the most complicated character in metallurgical research.

A number of small metallurgical microscopes, workshop types, and also Brinell hardness testers will also be exhibited.

The Hearson Electric Furnaces—tube and muffle type—will also be in operation, together with a range of Hearson temperature-controlled equipment, including the Hearson low-temperature annealing oven, the Hearson moisture-content and drying oven, and several types of thermostats for controlling temperature of gas- or electrically-heated cabinets for mould- or core-drying, etc.

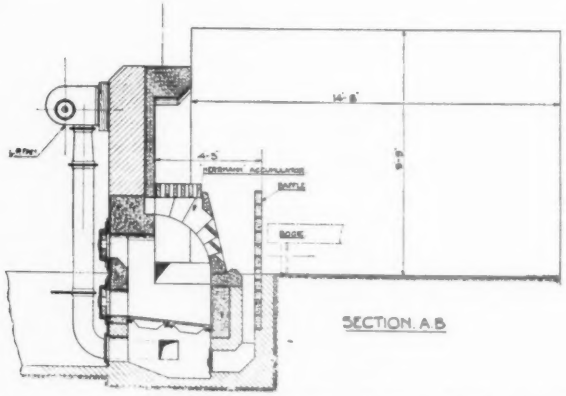


Fig. 2.—British Herrmann Drying Stove. Thomas E. Gray & Company, Limited.

J. Parish & Company, Loam Quarries, Erith, Kent, exemplify by means of their exhibit the progress recently achieved in sand testing as in addition to showing samples of their six grades of Erith loam, they supply users with its standard physical properties. These were detailed in our issue of November 4, 1932. In addition, they have on the stand samples of Parish's white-silica sand for core making. According to Keighley Laboratories this has the following physical composition:—

	Gravimetric percentage.
Clay	0.3
Fine and coarse silt... ...	0.4
Fine sand	92.6
Medium sand	6.5
Coarse sand	0.3

This report adds that "the grains as seen under the microscope are uniform in size and shape and are free from undesirable inclusions." The chemical analysis reveals that it contains 99.3 per cent. of silica. A number of foundries have enriched the stand by loaning castings made in moulds prepared with Erith sand.

Robson Refractories, Limited, 47, Coniscliffe Road, Darlington, have as their principal exhibit cupoline, a plastic refractory material extensively used for lining and patching cupolas and other furnaces throughout the British foundry industry. Many visitors will be interested in the Speedy Moisture Tester. We, personally, have had the privilege of handling it and immediately appreciated its worth as a rapid method of evaluating the moisture content of sands and other more or less finely-divided material. We strongly advise those who have not yet handled the Speedy machine to make a few tests for themselves.

Highpor insulating bricks, slabs and pipe-covering sections are of extreme interest in view of articles we have recently published which showed the loss in pence per hour per sq. ft. of furnace roof. The following table extracted from an N.P.L. report gives the thermal conductivity expressed in two sets of units for hot-face temperatures of 200 deg. C., 400 deg. C., 600 deg. C., 800 deg. C. and 1,000 deg. C., the cold face being maintained at about 30 deg. C.

Hot face temperature. ° C.	Gram calories per sq. cm. per sec. for 1 cm. thickness and for 1° C. difference in temperature.	B.T.U.'s per sq. ft. per hour for 1 in. thickness and for 1° F. difference in temperature.
200	0.00024	0.69
400	0.00028	0.80
600	0.00031	0.90
800	0.00035	1.00
1000	0.00038	1.11

We are only just beginning to familiarise ourselves with these new constants, but it seems that ordinary firebrick is 10, medium insulation 3 and best insulation 1, and as the figures for Highpor average out at 0.89 this appears to be pretty good.

The firm is also showing a patented Aerator furnace and, whilst commending the system, we object to the phrase "to burn coal you must have air, the more air the fiercer the fire and less smoke." We suggest that there is a practical maximum, but the secret of economic combustion is rate of combustion associated with heat insulation. This method of expression aligns itself well with the design exhibited. In additon to these the firm is showing a number of proprietary

materials such as Finitol, a mould facing; Fluxitol, an exothermic powder for the reduction of beads on iron and steel castings; Ados, a desulphuriser; Kerasit for setting runners when casting ingots by bottom pouring and mending ingot mould cracks; ingot mould varnish black and ingot mould varnish silver and core oil.

Spencer & Halstead, Limited, Ossett, near Leeds, who specialise in dust extraction, have an exhibit consisting of examples of Spenstead cast-iron and steel-plate fans; a working model of a Spenstead fan coupled up to a Spenstead patent dust filter; a small exhibit of a sand-blast cabinet and pressure apparatus of Gutmann design, and examples of hoods for fettling wheels for the collection of dust and the safeguarding of the worker in the event of the wheel flying. These exhibits are supplemented by photographs of plants installed.

Thomas Wilkinson & Company, Limited, Middlesbrough, have as their principal exhibit Carlton Patent Blacking. In this connection it is interesting to note that on occasion the firm ships—not coals to Newcastle—but blackings to Ceylon, where the raw materials have their origin. This exhibit is supplemented by a large range of foundry requisites, including Thames loam, which they ship to the North-East Coast and Grangemouth by coasting steamers. Mr. Wilkinson hopes to be personally present for the period of the Exhibition.

Foundry Plant.

F. Gilman (B.S.T.), Limited, Head Offices, 221, High Street, Smethwick, Staffs, are exhibiting a range of portable flexible drive grinders ranging from ⅛-h.p. machines to take small wheels and grinding shapes up to 2 in., to heavy

Grinding Flashes from a Casting. F. Gilman (B.S.T.), Limited.

grinders incorporating 2½- to 3-h.p. motors for taking wheels up to 10 in. dia. The range of machines for grinding and drilling work includes ¼-h.p., ½-h.p., ¾-h.p., ¾-h.p., 1-h.p., 1½-h.p. and 2½-h.p. motors. The range of sizes of grinding wheels for which machines can be supplied runs from the smallest die-sinking shapes and sizes up to 10-in. and 12-in. wheels for very heavy fettling work. The same machines when used for drilling can be used for drilling in metal up to 1¼ in. dia. holes as a maximum size. Suitable grit and grade of wheels are provided for steel, cast iron, brass, aluminium or other metals.

The range of machines exhibited includes single-speed sets, two-speed sets, four- and eight-speed sets. Special machines are being shown for surface-sanding work, for trimming up and cleaning off welds, and equipment is being exhibited which will be of considerable interest to users and makers of dies of every description.

A special machine is being demonstrated for die-grinding and die-finishing work. All the machines shown are entirely British from first to last, as are the working heads and attachments. This firm manufactures all its own flexible shafting and makes a complete range of shafts from 4 mm. dia. up to 30-mm. size. Such shafts can be produced in any lengths required. Messrs. F. Gilman (B.S.T.), Limited, are also exhibiting air grinders of various sizes suitable for firms having air supply available and preferring this form of drive to electrical machines.

The personnel of the stand will include:—Mr. W. S. Cobb, Resident Representative for London and Home Counties; Mr. S. E. Miller, Representative for Birmingham, South Midlands, South-East Coast and South Coast; and on most days Mr. G. H. Thompson and Mr. H. M. Hands, Managing Directors.

Grant & West, Limited, 17, South Street, E.C.2, are showing "Selek" metal-to-metal jointing material in powder form, which, in practice, forms a non-oxidising, non-rusting joint, guaranteed to make tight and keep tight joints under the most exacting jointing conditions such as steam, super-heat, water, gas, alcohol, spirits and chemicals.

"Belfo," a British-made belt-treating material, for the treatment of all forms of belting, including leather, hair, balata, cotton, composition, link, etc. It makes the belt slip-proof, and improves its life by rendering it impervious to the destructive action of workshop conditions. "Ropres," a new product, is especially designed for the treatment of steel-wire ropes and cables, used for haulage and kindred conditions. The effect of "Ropres" is to penetrate right into the heart of the rope, lubricating each individual strand, and rendering the rope waterproof, damp-proof and acid-proof.

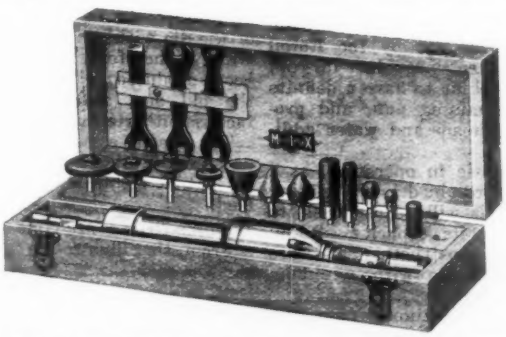
Other proprietary articles exhibited are "Ropres," a material for rust-proofing steel-wire ropes and cables; "Plastiloy," a plastic-metallic packing of high-melting point; "Cretex," a plastic-roofing compound for rendering a slate, tiled or corrugated-iron roof weather-proof; "Flinso" tinning compound and "Flinso" aluminium solder; "Paisol" paint remover; "Riscor" black varnish and "Radiolite," an unbreakable glass substitute.

W. T. Nicholson & Clipper Company, Limited, "Clipper Works," King Street, Salford, Manchester, are showing the improved "Klincha" belt-lacing machine. It embodies many improvements, the principal features of which are as follow:—It has a detachable magazine, facilitating the insertion of hooks into the machine when making the joint, and improvements enabling the machine to be operated with one hand, leaving the other free to hold the belt in the correct position while the joint is being made. It should be mentioned that the "Klincha" belt fasteners are now mounted on an outside paper strip, and made up in 12-in. lengths, preventing any lateral displacements, and making it easier and quicker to place the fasteners in the machine. The fasteners can be cut to any length required without disturbing the hooks, which are held in the correct position and spacing independent of the slots of the machine, and thus no time is wasted in straightening out displaced hooks, as occurs with other carded types. Joints made with the "Klincha" system are flexible, detachable, interchangeable, smooth running and will run round the smallest pulleys without knock or jump. No skill is necessary or stoppage of machinery involved.

The "Python" file and tool handle has a steel coil spring pressed into the centre which is secured in its place by a specially-designed ferrule. These two together take up all the pressure when the file is driven into the handle. The ferrule cannot be removed without destroying the handle.

An improved "Klincha" belt cutter is also shown. It can be operated with very little effort and leaves one hand free to hold the belt in correct position. It cuts and squares the belt with accuracy. The knife arm lifts up to allow the belt to be put in place without being threaded under the knife. There is a safety guard covering the blade, which makes it impossible to cut hands or knick the belt.

The "Klincha" belt-cutting shears complete the exhibit. One of the cutting blades of the shears is furnished with saw teeth inclined towards the handle. These teeth hold the material fast and prevent its slipping towards the point of the shears. Leather, balata and woven belting, sheet-rubber washers, strips and soft packing materials can be readily cut square or with inclined edges by this method.



High-Speed Air Grinder, by F. Gilman (B.S.T.), Limited.

Reavell & Company, Limited, Ranelagh Works, Ipswich, have as their main exhibit a range of DPV compressors. These compressors make ideal components for portable compressor sets due to:—(1) Their high rotational speed, which makes them particularly suitable for direct coupling to electric motors, petrol, paraffin and Diesel engines; (2) neat and clean design; (3) high volumetric efficiency, and (4) quieter and almost vibrationless operation. The body of the compressors are specially designed to fit comfortably into the chassis on portable sets. The compressor itself is a vertical single-acting single-stage two-crank water-cooled machine. The crankshaft is of best quality forged steel and runs in easily renewable die-cast white-metal bearings. The cranks are arranged at 180 deg. and are fitted with balance weights.

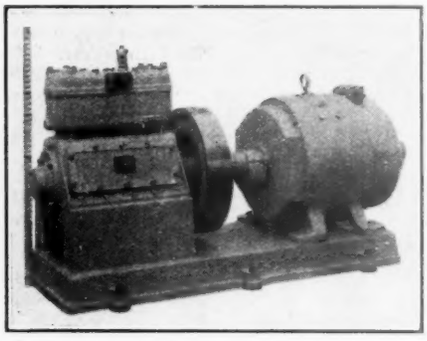
The pistons and piston valves are made of special aluminium alloy, and the connecting rods are of drop forged steel. The connecting rod big-end bearings are of easily renewable die-cast white-metal, and the small-end bearings consist of solid phosphor-bronze bushes working on accurately-ground gudgeon pins of case-hardened steel. The eccentric rods which operate the piston-type suction valve, are lined with white-metal at the bottom ends and bushed with phosphor-bronze at the top ends.

The delivery valves are of the firm's standard low-lift concentric ring-plate type, the ring-plates being made of special stainless steel. The lubrication is of the forced-feed type, oil being supplied under pressure by a gear-type pump driven from the end of the crankshaft. The oil is fed first to the main crankshaft bearings, and then through oil ducts in the running gear to the connecting rod and eccentric rod big and small ends. The oil on returning to the sump passes through a removable oil strainer before entering the pump. A pressure gauge and oil-

regulating valve are fitted on the pump to enable the correct oil pressure to be maintained in the bearings.

The valves are lubricated by adjustable sight-feed lubricators, which are mounted in a convenient position on the crankcase, and are connected to the delivery side of the oil pump by solid-drawn copper pipes. A combined crankcase breather and filter is fitted on the crankcase door, and an oil-dip stick is provided so that the level of the oil in the crankchamber may be checked.

One of the special features of the compressor is the action of the piston valve, which gives



Compressor of Particularly Clean Outline by Reavell & Company, Limited.

a large port opening for the entry of air on the suction stroke, and which traps a small quantity of air on the delivery stroke, delivering it slowly through the valve because of the comparatively slow travel of the piston valve. It is this feature which ensures a high-volumetric efficiency, and at the same time allows the delivery valve to seat slowly and quietly, thus prolonging its life. The compressor is complete with all the usual fittings, and a special unloader may be incorporated.

The stand is in charge of Mr. R. L. Quertier, B.Sc., A.M.Inst.C.E., M.I.Mech.E., a director and the manager of the firm's London office.

Sterling Foundry Specialties, Limited, of Bedford, are showing on Stand No. 7, Row E, a large range of their well-known "Sterling" rolled-steel moulding boxes and included on the stand are several types of "Sterling" foundry wheelbarrows suitable for sand, coke and pig-iron. During the past ten years the rolled-steel moulding box has become exceedingly popular on

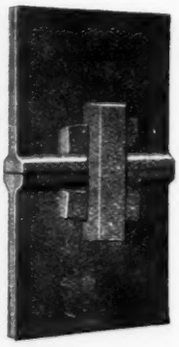


Fig. 1.—Shows the New Section used for Steel Moulding - Boxes by Sterling Foundry Specialties, Limited.

account of its lightness and unbreakable features, and there are very few foundries in this country to-day where the "Sterling" box does not form a considerable portion of the box equipment.

Since the last Foundry Exhibition this firm has brought out a new heavy section rolled steel for making larger types of moulding boxes, and boxes suitable for the production of such work as heavy dry-sand castings. Fig. 1 shows this new section, which takes the form of a bulb bar, the thickness of the plate being ⅜ in., swelling out to 1 in. wide at the parting. This same illustration shows also a particularly neat arrangement for clamping box parts together. It consists of taper dovetailed bars welded on to the box, over which are pushed loose "C" clamps

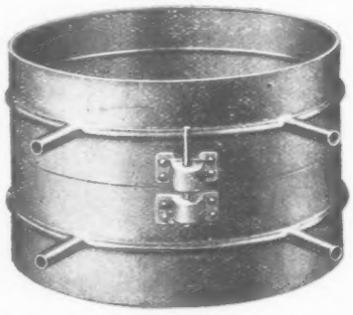


Fig. 2.—Circular Moulding-Box by Sterling Foundry Specialties, Limited.

similarly dovetailed. Two illustrations of "Sterling" boxes are given. Fig. 2 shows a circular box made from the familiar light section "Sterling" solid-rolled steel, and Fig. 3 shows a square box in the new heavy section. It is worthy of note that what is probably the

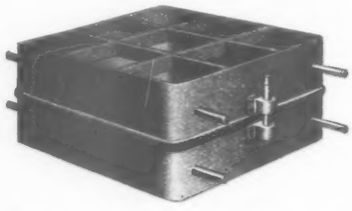


Fig. 3.—Shows a Square Box of the New Heavy Section by Sterling Foundry Specialties, Limited.

largest continuous pouring plant in this country and certainly the latest large foundry to commence operations here, viz., the Stanton Ironworks Company's new foundry at Holwell, is entirely equipped with these new heavy pattern "Sterling" boxes.

Fordath Engineering Company, Limited, of Hamblet Works, West Bromwich, are showing three types of Rotoil mixing machines:—(1) A complete electrically-driven continuous-operation mixer, with sand-elevating and riddling gear; (2) a "Senior" mixer of standard type arranged for belt drive; and (3) the laboratory mixer. The first Rotoil mixer is designed for working in conjunction with continuous process plants, and the following points are given by the makers, who claim it to be the first completely satisfactory machine offered to meet this purpose. Intensive mixing is carried out by the Rotoil principle, and the design provides for all materials fed into the machine to have a definite "period dwell" in the mixing pan, and provision is made for clay cream and water additions.

The machine is automatic in operation, as a normal volume of sand is retained in the mixing pan when working, and it will adjust itself to any varying load within its capacity. Rotoil machines are of robust construction and are designed to give long service with minimum attention.

In addition to its continuous-operation features, this machine can be used for batch mixing, as it is also fitted with a standard rapid-action shutter which remains shut when the machine is working on the continuous-operation principle. The maximum rate of feed for the No. 4 continuous-operation Rotoil mixer as shown on the stand is 6 tons per hour.

The mixed sand is discharged by means of an overslung sand ejecting and aerating machine formed integral with the mixer, and the sand stream is adjustable within a wide angle of elevation. The mixer is driven through enclosed gearing and centrifugal clutch by a 14-b.h.p. motor, and a separate motor of ½ b.h.p. drives the sand ejector and aerator. Arranged in a convenient manner for feeding the mixer is a well-designed and robust chain-bucket elevator and ridding gear, driven by a 3-b.h.p. motor. This forms a very reliable unit capable of giving long and satisfactory service.

The Rotoil Batch Mixing Machine shown has a capacity of 4 cwts. and mixing is accomplished in from two to four minutes according to the nature of the bond and the condition of the sand. This is a belt-driven machine and the power required is 7 b.h.p. when employed on core sand, or 9 b.h.p. on moulding sand or ganisters.

The Rotoil Laboratory Mixer has been produced to assist research work and the preparation of special sands. This small machine faithfully reproduces the action of the larger machines, and any results obtained experimentally can be taken as a standard on which to base production programmes for the larger machines.

The Fordath Multiple Rotary Core Machine, which is shown for the first time, is the only outstanding improvement on the old type. For the first time in history, a rotary core machine has been produced to extrude a number of cores simultaneously on the one die; in fact, as many as 20 cores can be extruded on this machine simultaneously, without the slightest difficulty. Whereas the old type of machine required separate screw conveyors for different sizes of dies, the Fordath machine requires only *one* conveyor. The conveyor consists of a parallel barrel on which are built multiple start threads which present a corresponding number of pressure surfaces adjacent to the face to the die. The conveyors carry pins placed at suitable distances on the periphery of the threads to keep the sand from adhering to the body of the machine. The conveyor consists of two parts, the forward part being the only one which is subject to wear, and which can be easily replaced when necessary.

Each die carries its own venting device, and the extrusion holes are accurately *ground* to predetermined but not parallel dimensions. Compensating devices are used to ensure proper packing of sand, and absence of friction, etc. The machine is very simple in operation; the dies are short, and the machine is so much improved over the old type, that many different kinds of sand can be used with equally satisfactory results.

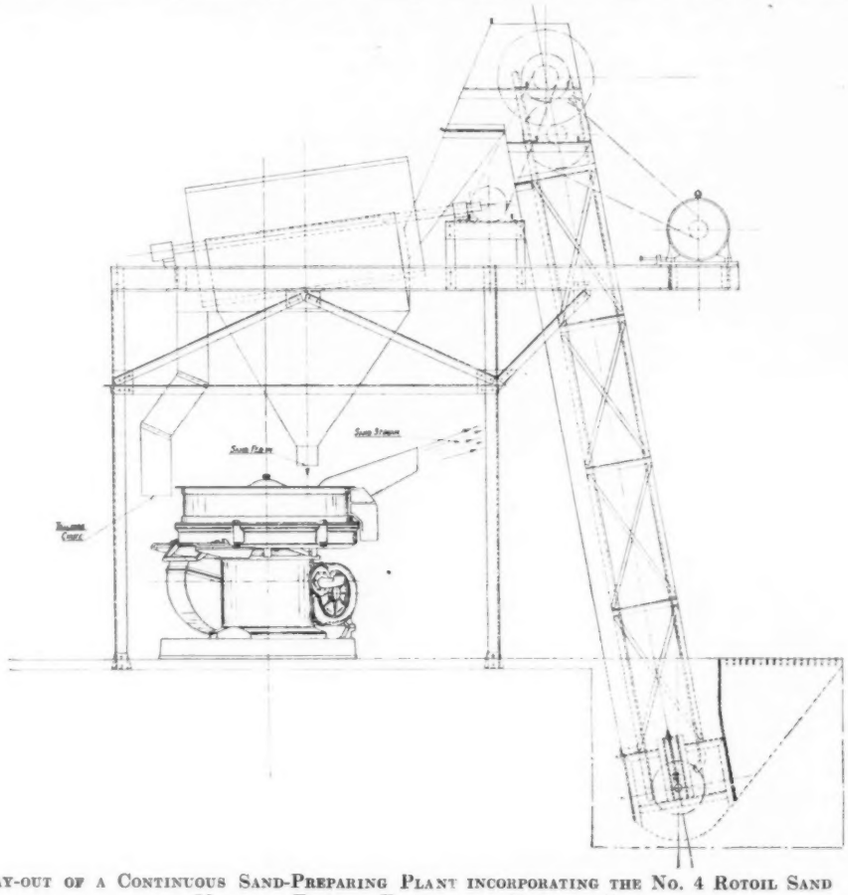
The cores themselves can be made true to within one-thousandth-of-an-inch in diameter, whilst all shapes of regular cores such as oval, hexagonal, etc., can be made with equal facility. It will be readily appreciated that on this type of machine, different sizes of cores can be made simultaneously on the same die. The feeding of the die with sand is automatic and fool-proof. Briefly, therefore, an entirely new machine has been produced, eliminating the bad points of the old one, and introducing many valuable factors hitherto unknown.

The machine and its component parts are patented in the British Isles, and applications for patent rights in foreign countries have been filed.

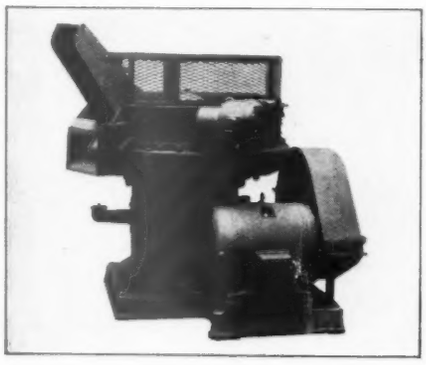
Power-Driven Multiple Rotary Core Machine.—From the illustration of this exhibit it will be seen that the machine is mounted on a cast-iron table of very substantial design and construction. Conveniently placed beneath the table are the driving shaft, carrying the main-drive pulley and the pulley for the machine drive. Below this is the foot pedal, controlling the clutch pulley for the operator. The driving shaft carries two self-aligning ball-race bearings.

The machine also carries a steel shaft fitted with ball bearing and a 12-in. pulley connected

by belt with the 6-in. pulley for the machine drive. Attached to the top of the machine is a hopper to carry the charge of sand, and shaped so as to afford the least obstruction to the operator. The interior of the machine consists mainly of the die and conveyor or worm screw. The die is held in position by two locating screws, which require the minimum amount of fixing. An adjustable table is fixed to the cast-iron table carrying the machine, in such a way that by means of an internal thread it can be raised or lowered by a simple turn to any required height. This adjustable table has machined grooves thereon, in which the core plates are located. The core plates are machined to take six or more cores, according to size.



Lay-out of a Continuous Sand-Preparing Plant incorporating the No. 4 Rotoil Sand Mixer by Fordath Engineering Company, Limited.



A Continuous Rotoil Sand Mixer by Fordath Engineering Company, Limited.

On reference to the illustration, it will be seen that the working parts are protected by sheet-metal covers, wherever possible. Lubrication is effected by means of large-sized Stauffer lubricators. Dimensions:—Height, 3 ft. 6 in.; length, 4 ft.; floor space, 4 ft. by 2 ft.; power required, 1 h.p.; speed of main shaft, 200 r.p.m.

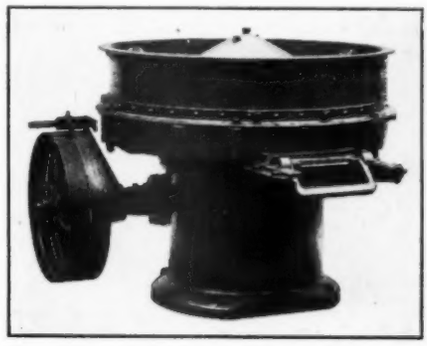
Hand-Operated Multiple-Rotary Core Machine, shown on the stand and illustrated, is similar in construction to the power-driven plant with the exception of the fact that the table is entirely eliminated and in place of the pulley wheel, as used on the power-driven machine, a well-balanced hand wheel and handle are provided. The machine is provided with bolts for securing to the core bench wherever required.

Core Oil Developments.

Until recent years the foundry industry bought core-making materials and took all risks and did all the experimenting necessary in using them. From the very beginning the Fordath concern realised the importance of the supply side of foundry work as a separate unit which was capable of wide development, and this could only be carried out if under the control of individuals who were familiar with the foundry in all its aspects, and others who were qualified to investigate the scientific side. The firm therefore divided its work into three departments; first, the factory for making the materials to be used for core-making; secondly, the laboratory to conduct the necessary research work to enable the factory to manufacture the best article for the purpose, and finally, the machine shop for determination of the best type of plant to be used.

Thus it follows that all raw materials, from wheresoever obtained, must be first of all tested on delivery to ensure uniformity of quality. These materials are obtained from wide sources in different parts of the world, but British wherever possible. In one instance their service enabled a firm with a plant which was standing idle to reopen it, and it has not been closed since that time, three or four years ago.

The types of core-making products shown vary from solid and semi-solid compounds to thin liquid oils. The main objects sought are: (*a*) Core strength, (*b*) green-bond strength, (*c*) low gas evolution and (*d*) absence of injurious gases or fumes during casting. The particular form of core-making material depends upon the purpose for which it is to be used, and this can only be determined by investigation. The baked cores must show: (1) Great permeability; (2) absence of tendency to absorb moisture; (3) high strength; (4) absence, in large cores, of sagging tendencies; (5) freedom from stickiness, and



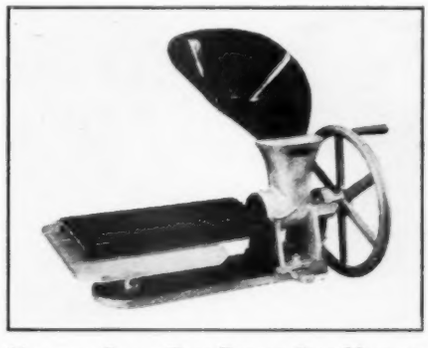
Rotoil Batch Mixing Machine by the Fordath Engineering Company, Limited.

(6) in shell-dried work, absence of tendency to coat the driers with foreign deposit.

Careful and regular control of raw materials has proved essential, and all the materials used are subject to routine tests for "green" bond, baked strength, gas evolution, etc. The field of application of these products is very wide, covering both ferrous and non-ferrous castings of all types and sizes. Success has been achieved with alloy irons, steels, Monel metal and phosphor-bronze, and also in the production of sand cores for centrifugal castings where they are subjected to certain very severe stresses. The production of perfect cores from $\frac{1}{8}$ in. dia. and upwards, by extrusion from a multiple die, has proved a simple matter with "Glyso" bonded sands. They have been also used successfully for facing sand in casting special alloy iron.

Non-foundry uses of these compounds include the briquetting of fine materials and the manufacture of abrasive stones.

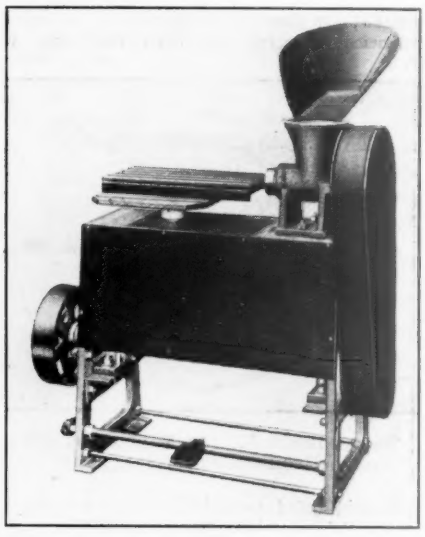
The firm's laboratory, besides conducting the usual routine tests, is actively engaged in developing new compounds to meet the demand of the foundry trade. Such a development as the core-blowing machine necessitated the introduction of mixtures particularly suitable for this purpose, and here again the firm has been successful with their bonded sands. The laboratory has undertaken a considerable amount of research work in connection with the time and temperature required to obtain the best baked strength for each compound, the amount of gas evolution, and the extent of moisture resistance of the bonded cores.



Multiple Bench-Type Rotary Core Machine by Fordath Engineering Company, Limited.

A good deal of work has been done also in determining what amount of oxygen is consumed during baking under standard conditions. The correct supply of oxygen has been proved to be as important as the baking temperature.

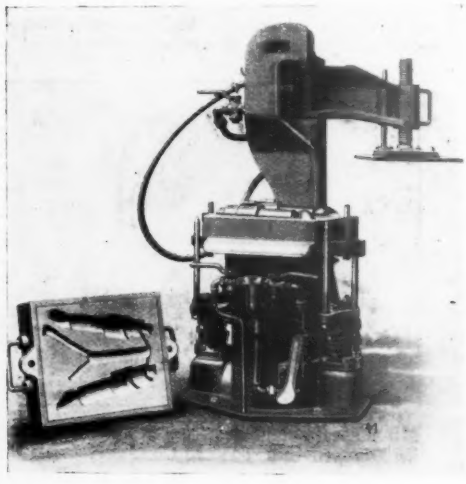
Service Department.—The Fordath Company has on its staff a number of men with wide experience in controlling foundries of many different kinds and in all kinds of metal. They are able to go into a foundry and superintend any experiment or the making of any casting and to follow it through to completion. In addition to the ordinary laboratory assistants, they have on their permanent staff a chief chemist who has taken a University degree in metallurgy; one who holds a degree in the chemistry of oils and organic substances; a pharmaceutical chemist, and another who has for a number of years controlled a very important works laboratory, as well as their foundry. The Service Department also includes four ex-foundry managers, of wide and varied experience in all kinds of metals. The firm has established branches for the manufacture of their products in Europe at the Hague, in India at Calcutta, and in Australia at Melbourne, and they have working arrangements with similar firms in other parts of the world. Visitors are welcomed at Hamblet Works at all times, where they can see for themselves the manner in which problems are tackled and the facilities available for so doing.

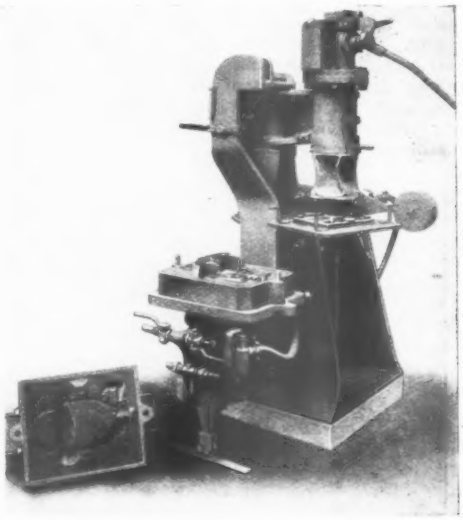


Power-Driven Rotary Core Machine by Fordath Engineering Company, Limited.

Tilghman's Patent Sand Blast Company, Limited, Broadheath, near Manchester, have arranged their exhibit to show sand-blasting apparatus as applied to every section of the foundry industry. For light-iron and steel castings they show a 7-ft. dia. rotary table machine, with sand-blast apparatus constructed for working at 60 to 80 lbs. pressure. The table is shown in motion but not actually "blasting." For heavier castings they show a 9-ft. by 6-ft. sand-blast room, complete with apparatus. For quite small castings they show a floor-mounting type sand-blast tumbling barrel with separate sand-blast apparatus, a combined tumbling barrel and sand-blast apparatus, and sand-blasting cabinets. Being important manufacturers of air compressors, they exhibit various sizes of single-stage, single-acting machines for pressures up to 100 lbs. per sq. in.; a single-crank, two-stage, double-acting, vertical compressor, suitable for 120 lbs. pressure. Of exceptional interest is a small single-acting air compressor, with the cylinder and crankcase cut away to show the internal parts. Finally, there is a portable petrol-engine-driven air-compressor set of 100 cub.-ft. capacity. All the sand-blast equipment shown is of the most modern design, is British throughout and has not been previously shown at any exhibition. The portable compressor set will be running on the stand, and the air used for demonstrating in one or other of the sand-blast cabinets.

Gustav Zimmermann, Düsseldorf-Rath, are showing moulding machines of the lifting and turn-over variety provided with a shockless table for simultaneous jolting and squeezing. The outstanding feature of these machines is that, unlike other machines, they continue jolting during squeezing. According to the nature of patterns and sand, it is possible with these machines to jolt first and then squeeze, to jolt and squeeze simultaneously or to squeeze first and jolt afterwards. In this way, there will be obtained according to special desire, soft to stone-hard moulds. The shockless working table jolter must not be confused with a hammer jolter. It works absolutely without shocks so that even plaster pattern-plates can be used on the machines without being damaged.





(right) P.W. Jolt-Squeeze Turnover Machine, and (left) U.G.O. Squeezer Moulding Machine, by Gustav Zimmermann.

In the pin-lifting machine, stripping is effected by compressed air and oil. This pneumatic-oil lifting device works quite independently of the skill of the workman, and unskilled workmen will effect a perfect separation of the mould from the pattern. The lifting speed is easily adjustable according to the type of pattern. In the turn-over machine PW, the separation of mould and pattern is easily effected by hand. The lowering device, arranged in the upper squeezing cross beam, guarantees a perfect separation even with big boxes and complicated patterns. The jolt-squeeze and turn-over machine, type PW, deserves special mention as, compared with most machines having turn-over plates, it is claimed that it saves seven manipulations, and thus works at higher speed.

At the last International Foundry Exhibition in Paris in September last year, these machines were designated the fastest moulding machines in the world and obtained the highest award, the "Grand Prix."

Besides the above moulding machines, the firm is exhibiting a pneumatic core blower, suitable for all core and moulding sands. The blowing of a core requires but a very small quantity of compressed air as there is not taken more compressed air from the reservoir than is necessary for the actual blowing of a core.

The exhibit also includes tools for the making of patterns and block-pattern plates. By means of these tools, pattern plates can be made in one's own foundry at a comparatively cheap price. A complete block-pattern plate, made with a tool of this kind, is being demonstrated on a simple squeeze-moulding machine.

The proprietor of the firm, Mr. Gustav Zimmermann, is to be in attendance on the stand during the whole Exhibition, together with two demonstrators for the machines.

Metal Treatment.

Atlas Preservative Company, Limited, Fraser Road, Erith, Kent, have on their stand a series of materials for the protection of metallic and wooden surfaces.

"*Atlas Ruskilla*" *Iron and Steel Paint.*—This is specifically designed for protecting structural iron and steelwork from rust. It has proved to be particularly well suited to cope with the unfavourable conditions usually existing in foundries, engineering shops and the like. When applied, it grips the metal firmly and forms a tough, tenacious film that keeps the metal safe from the corrosive action of acid fumes, steam, moisture, etc. It forms a protective covering for structures and roofing exposed to the weather. Moreover, being elastic, it does not crack or peel when subjected to change of temperature or vibration. Whilst essentially a quality product, it is not expensive. In fact, its splendid covering power makes it cheaper to use than ordinary lead or oxide paints. Its easy flow makes for speedy work and less labour costs, whilst its remarkable durability obviates the need for frequent repaintings, and so brings upkeep costs down to absolute bedrock. "Atlas Ruskilla" is available in black, white, aluminium and a range of very attractive colours all of which dry with a pleasing glossy finish.

"Aluminium" is particularly useful for the

protection and decoration of workshop interiors. For not only is it of pleasing and cheerful appearance, but its bright metallic surface reflects and diffuses all light reaching it, and thus provides an abundance of natural, non-glare illumination throughout the building, at no cost whatever. To those concerned with the economic upkeep of buildings and plant "Atlas Ruskilla" offers scope for keeping such property in perfect condition for the very minimum of annual expenditure. "Atlas" Rust Preventive affords a rapid, simple and economical means of preventing rust forming on bright ferrous surfaces. It is non-poisonous and neither acid nor alkaline.

"Temporary Film" supersedes the use of oil, petroleum jelly and grease for preserving machines, castings, fittings, etc., whilst in store or left in the open. It sets in a few minutes into a firm, clean, thin film which is not removed by subsequent handling. It is not necessary to remove the film when putting working parts into use, but removal can be easily effected by the use of a spirit-moistened rag.

"Permanent Film" is for use on articles such as machines, tools, etc., prepared for exhibition, where a hard, non-greasy and perfectly transparent film is essential. Both grades afford adequate protection from rust and can be applied by dipping, spraying or by brush.

"Releasall" is a product for freeing rusty bolts, nuts, etc.

I.C.I. (Alkali), Limited, has staged an exhibit showing sodium carbonate (soda ash) in the two forms suitable for use in iron foundries, viz., dense sodium carbonate and fused sodium carbonate. The former is used for general castings when the metal is tapped into ladles of 6-cwt capacity and upwards; while the fused blocks are added to the cupola charge where small ladles are used and very hot metal is required for running castings of very thin section.

Many castings are exhibited, showing the range of iron and steel products for which the soda-ash process is applicable, such as pig-irons, alloy iron, grey-iron castings, malleable-iron and Tropenas-steel castings. Test-bars demonstrate the excellent physical properties of metal treated with sodium carbonate; and a number of specimens and illuminated transparencies illustrate in a striking manner the powerful effect of the treatment in degasifying the metal and eliminating segregations of harmful impurities. A microscope will be available to enable comparisons to be made between the actual microstructure of treated and untreated specimens.

Leopold Lazarus, Limited, 78/79, Leadenhall Street, London, E.C.3.—The primary idea of this exhibit is to demonstrate the use of ferro-alloy briquettes in cupola work. These briquettes are identical in composition, shape, etc., with the EK-Pakete used extensively on the Continent and the E.M. Briquettes used in America. The various ferro-alloys used in the manufacture of the briquettes are made in Norway by the well-known firm Aktieselskabet Meraker Smelteverk. Included in the exhibit are:—(1) *Silicon briquettes*, in two sizes—"whole" size containing 2 lbs. and "half" size containing 1 lb. silicon; (2) *Manganese briquettes* (two sizes)—"whole" size containing 1 lb. manganese and 1 lb. silicon, and "half" size containing ½ lb. manganese and ½ lb. silicon; (3) *Chromium briquettes*, each briquette containing exactly 1 lb. chromium; (4) various photographs and photo-micrographs; and (5) a section of an automobile cylinder made with the aid of briquettes.

A full technical service is given with the briquettes which is conducted by Mr. J. H. Williams, B.Sc., F.I.C, who will be in charge of the stand. The firm is equipped and has complete facilities in its technical department for carrying out any special work relating to the production of cast iron.

The industry will look forward with interest to this particular development, as it can be completely divorced from any idea of quackery. The use of briquettes offers an ease of control not easily otherwise obtained in the production of cast iron to exact analysis.

Mond Nickel Company, Limited, Thames House, Millbank, London, S.W.1.—Visitors to this stand will have an opportunity of obtaining free copies of a new foundry chart, which gives, in a novel manner, recommended compositions of nickel cast iron for some 50 common types of casting. In addition to chemical composition, strength and hardness figures are presented, whilst data are also included on methods of adding nickel and chromium, both in the ladle and the cupola, and on the weights of alloys required for different quantities of iron. A large representation of this chart, 10 ft. in dia., is the dominant feature of the stand.

Nickel cast iron will be prominent among the exhibits, and will include castings representative of engineering irons, heat-treatable irons and austenitic irons. The first group will comprise brake drums, a cylinder head, a petrol-pump body, etc., showing how the addition of nickel gives improved toughness and strength, greater uniformity and hardness, better-machining qualities, freedom from porosity and greater resistance to wear.

Austenitic-nickel cast iron is attracting a considerable amount of attention at the present time on account of its marked degree of resistance to corrosion and heat, and its high electrical-resistance, coupled with a low-temperature coefficient of resistance. Castings chosen to illustrate these qualities will be shown, while among the heat-treatable irons will be displayed roller-end castings for wooden textile rollers, the tangs of which have been bent over to indicate the malleability after heat-treatment.

Apart from nickel-cast iron, castings in nickel-alloy steel and in the different non-ferrous alloys of nickel will be displayed.

NICKEL CAST IRON
RECOMMENDED ADDITIONS FOR ENGINEERS & FOUNDRYMEN
TO OPERATE CHART. Select from general classification in blue ring on lower disc the type of casting in which you are interested. Set arrow at numbered triangle corresponding to specific application. Recommended chemical composition will be found in windows on left of centre, and approximate physical properties will be found on right of centre.
NOTES.
THE MOND NICKEL COMPANY, LTD.
Thames House, Millbank, London, S.W.1.
LINERS
HEADS
GEARS
CRANKS
MANIFOLDS
AXLES
PISTONS
PISTON RINGS
PULLEYS
DIES
DRUMS
PUMPS
POTS
CYLINDERS
CAMS
VALVE BODIES

A New Foundry Chart evolved by the Mond Nickel Company, Limited.

The following list is typical of the samples to be shown:—Diesel-engine connecting rods in nickel steel, nickel-bronze worm wheels, Monel metal impellers, aero-engine cylinder heads in nickel-containing aluminium alloy, nickel-silver water taps, and heat-resisting castings in nickel-chromium alloy. Technical publications dealing with the properties and applications of the different materials will be available free of charge.

Major, Robinson & Company, Limited, Scols Works, City Road, Cornbrook, Manchester, have on their stand a number of pipe-bending machines and proprietary articles. Of the former "Scols Senior" range of models commends itself to us as being extremely useful for the average foundry. They are portable and of the open-frame type, and model B will tackle tubes up to 3 in. bore of steam, gas or hydraulic quality. Amongst the proprietary materials on exhibit are the well-known Scols cements for beautifying iron, steel and non-ferrous castings. We have on occasion discovered castings which have been "mended" by means of these cements and have been favourably impressed by the colour, match and hardness which resulted. Scols cements are extremely useful, but never receive the publicity they deserve as the foundryman's best friend.

Melting Plant.

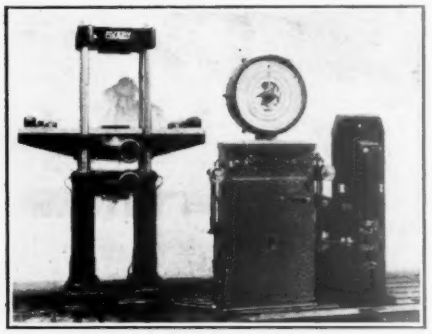
W. & T. Avery, Limited, Soho Foundry, Birmingham, have as their principal exhibit a new self-indicating universal testing machine, which represents a real advance in this field.

In this self-indicating machine the weighing and straining are effected through the medium of hydraulic pressure, which is supplied simultaneously to the main cylinders, and a small cylinder housed in the load indicator cabinet. The ram of the small cylinder is reduced in area proportionately to that of the main cylinders.

The pressure is supplied by a positive displacement three-ram pump of the reciprocating

type. The rams are ground and lapped to a fine sliding fit in three sleeves, and no packings are employed. A suction bonnet is arranged on top of the pump body, the whole arrangement being inverted; that is, the rams are arranged above the shaft, and the valves above the rams.

A constant speed motor is directly coupled to the pump, which, when running at 750 r.p.m., has a delivery sufficient to give to the main



A Self-Indicating Universal Testing Machine by W. & T. Avery, Limited.

testing rams a maximum speed of 4 in. per min. Control valves are arranged on the cabinet of the load indicator, one on either side and include a fine regulating valve, and an exhaust valve.

The testing unit comprises two single-acting cylinders bolted to a common base. The bottom tensile specimen holder is secured at the top of the cylinders, making a rigid assembly. The top holder is incorporated in the beam casting secured to the main rams, which are ground and finished to a fine clearance fit in the cylinders in order to function without packing. Directly above the beam casting is arranged a crosshead supported upon rods secured in lugs cast at the sides of the main cylinders for this purpose.

A standard dial mechanism in a dustproof and moisture-proof housing is used to indicate the test load, which is conveyed from the small proportional cylinder in the cabinet below, through suitable reduction levers. A loose pointer is provided to indicate the maximum load reached during a test. This pointer is carried on ball bearings in a separate housing secured to the dial glass. During a test the weighing pointer makes contact with the maximum pointer and pushes it freely round the dial until the weighing pointer recedes. This action breaks an electrical circuit and allows a small friction pad to retain the maximum pointer in position to indicate the highest load reached, until relieved by hand.

The machine has two ranges of capacity, namely, 60,000-lb. by 100-lb. divisions, and 24,000-lb. by 50-lb. divisions. The change of capacity is made by a change fulcrum device operated by a hand lever. The three units are grouped to give every convenience in operation; the load indicator and all controls being adjacent to one another.

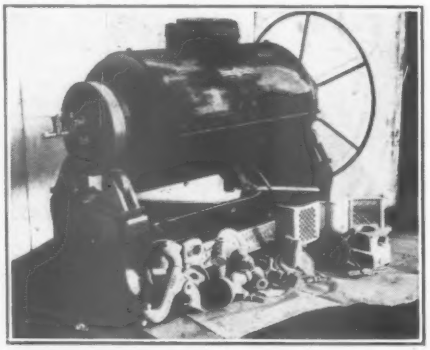
A special feature of the machine is the automatic-control device by means of which a test load may be maintained (within small limits) upon a specimen. When using this device two pump-suction valves are cut out, leaving one only in service under the control of a solenoid. If the solenoid is energised, the suction valve is depressed and the pump delivery suspended, and *vice versa*. Limit contacts are arranged upon "busbars" at the rear dial, and the weighing pointer operates between them. When contact is made with the high limit the pump delivery is suspended, and the load gradually falls off until contact is made with the low limit, when the solenoid is de-energised and pump delivery resumed. This procedure will continue for any reasonable period. Provision is also made to carry out automatic-control tests by means of a spring-loaded valve, which is located on the indicator cabinet directly beneath the main control valve. This valve is normally kept closed, but may be set to relieve at a pressure to correspond with a desired load, within a small limit of fluctuation.

Other machines exhibited include a rapid self-indicating hardness testing machine.

Sir W. G. Armstrong, Whitworth & Company (Engineers), Limited, Scotswood Works, Newcastle-upon-Tyne, have two main exhibits, an oil-fired rotary furnace and pneumatic tools. For the latter, in addition to showing a complete range of foundry tools, the firm have facilities available for demonstrating their latest "Plus"-type rotary air grinders, in all sizes, and "Pigmy" chippers, and floor and bench types of sand rammers.

Many special features have been incorporated in the latest designs, and the range of Armstrong Whitworth tools is characterised by reliability, combined with economy and speed of working.

Metal-melting Furnaces.—This exhibit comprises a 3½-cwt. oil-fired, non-crucible, semi-rotary furnace actually fired by oil. Although the arrangements for showing the furnace "lighted up" have entailed considerable extra work and expense, it was felt that it will be fully repaid by all those connected with the trade being able to see the furnace under normal working conditions. The latest special feature of the furnace takes the form of a bottom pour-



Semi-Rotary Non-Ferrous Melting Furnace with New Tapping Device by Armstrong-Whitworth.

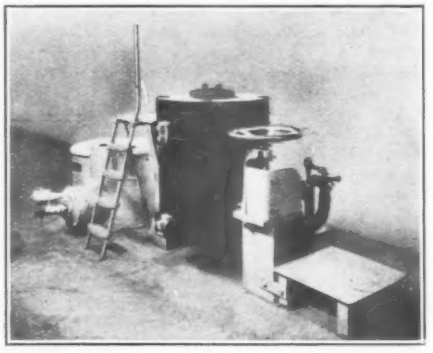
ing valve, which provides the following advantages:—(1) The metal remains at one temperature, there being no need to reduce the flame; (2) oxidation reduced to a minimum; (3) clean metal only drawn off; and (4) shanking time eliminated, as the moulds are filled direct. This furnace is the smaller of two sizes, the larger being similar in construction, but having a capacity of 9 cwts.

The Constructional Engineering Company, Limited, Titan Works, Birmingham, have a Titan cupola as their principal exhibit. They show a bottom section of a standard 4 to 5 tons per hr. furnace. The design embodies patented and other improvements, including tuyeres independently adjustable from the outside air belt. Opposite each tuyere an inspection door is fitted, giving access to the full area of each tuyere. Incorporated in the design of the inspection door are separate sight and poking holes. The cupola operator can when necessary clean out a tuyere without risk of an escaping blast striking his face. Special fusible-plugs are fitted on the underside of the air belt. The air belt is welded throughout, being definitely airtight. The cupola baseplate is of mild steel and the columns are of special drawn-steel tubular construction fitted with wrought-iron bases and caps. The above features were first introduced on Titan cupolas, of which upwards of 1,700 have now been built. Whilst the latest "Constructional" design of enclosed-type spark arrester is shown, there is also a model of the Entwisle spark arrester, of which they have the sole-manufacturing rights. The melting section is completed by a standard Titan cupolette, forming a complete and self-contained unit, with a melting capacity of 30 cwts. per hr. Over 1,400 of these cupolettes are now in operation in engineering shops, foundries, etc., at home and abroad. A Titan mechanical riddle of new design, portable and self-contained, complete with motor, is shown in operation. In the fettling shop there is the Titan tumbling barrel. It is fitted with raising and lowering gear, operated by hand from the front, complete with fast and loose pulleys. The barrel is of mild steel, but can also be supplied in wood. This machine is particularly suitable for light-ferrous and non-ferrous castings. "Titanite"—the pattern-making material—has effected considerable reductions in the cost of pattern-plates. A variety of pattern-plates and oddsides of all types are shown. From some of these over 50,000 moulds have been made. A 10-cwt. capacity geared ladle, with totally-enclosed worm gearing is shown. It is typical of a range of ladles with capacities from 10 cwts. to 15 tons. A variety of pressed-steel ladles and lead ladles are also shown.

A new type of Titan oil-fired sand dryer is shown for the first time. The dryer is claimed to be highly efficient and extremely economical on fuel. It has a capacity of 3½ to 4½ tons of sea sand per hr. The Titan core stove is arranged for coke or gas firing, and is a complete and self-contained unit. The exhibit is completed by an example of Wood's "Kwiksteam" patent boiler; standard design of air receiver, typical of a wide range of sizes and capacities; and a range of barrows, specially designed for foundry use and for handling pig-iron.

The Morgan Crucible Company, Limited, Battersea Works, London, S.W.11, are showing a wide range of Morgan's patent tilting furnaces. For oil fuel they are showing Morgan's latest furnace, Type CA of 400-lbs. brass capacity. This type is made in 10 sizes from 200-lbs. to 1-ton brass capacity, and is an extremely economical melting plant for aluminium, brass, gunmetal, alloy cast iron, etc. The metal is entirely protected from the products of combustion, thus ensuring purity and negligible metal losses. A fuel consumption as low as 8 per cent. has been obtained.

For coke fuel they are showing a Type S furnace of 200-lbs. brass capacity. For those who prefer coke as fuel a more efficient furnace would be difficult to find. The essential features



A Typical Oil-Fired Crucible Furnace by the Morgan Crucible Company, Limited.

for the full protection of the metal from the products of combustion are equally embodied in this type. It is obtainable in sizes from 150-lbs. to 1,000-lbs. brass capacity.

Lift-Out Furnaces.—Type P furnace, which uses oil fuel, is recommended as an efficient and

economical furnace for all non-ferrous melting. It is also admirably suited for high-temperature work such as cupro-nickel, nickel and steel melting. It is made in four sizes to take crucibles from 30-lbs. to 350-lbs. brass capacity; actually a size No. 2 is exhibited.

Morgan's natural-draft furnace, which is represented on the stand by a No. 2 size (50-lbs. capacity), has been carefully designed to ensure correct combustion of the fuel, thus leading to economy in coke consumption and maximum crucible life. This furnace is obtainable in 12 sizes, the crucible capacity ranging from 40 lbs. to 400 lbs. of brass.

Bale-Out Furnaces.—This oil-fired type of furnace has been designed for the efficient melting, or for maintaining at the required casting temperature, of aluminium and aluminium alloys under those conditions best calculated to yield metal free from gas and other contamination at the desired temperature without overheating. These furnaces can be supplied in sizes ranging from 50 lbs. to 10 cwts. of aluminium. A furnace of 150-lbs. capacity is exhibited.

In addition to the furnaces, a large range of crucibles, retorts, stoppers, nozzles and other refractory goods made from plumbago are shown. These are supplemented by a wide range of straight firebricks and fireclay goods. Few firms are better placed to give service to their *clientèle*. Not only is an experimental furnace room available for the conduct of melting tests on clients' materials, but also a large staff of experienced furnace engineers are available for helping founders with their difficulties.

The personnel of the stand will include Mr. L. S. Emms, director; Mr. C. F. Atchison, technical manager; and Mr. W. Cathcart, sales manager.

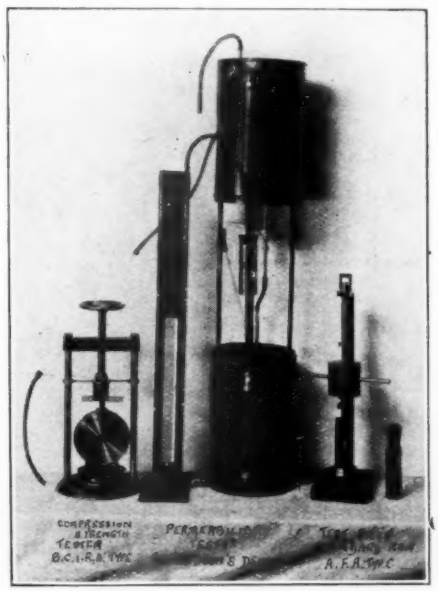
Ridsdale & Company, Metallurgical and Consulting Chemists, 3, Wilson Street, Middlesbrough.—The object of Messrs. Ridsdale & Company's exhibit is to illustrate what is being done towards simplifying, speeding up and attaining a higher degree of accuracy in the chemical analysis of cast-iron, steel and non-ferrous materials. This is achieved by (1) British Chemical Standards and (2) the Analoid system. British Chemical Standards, which were first introduced about 18 years ago, are now used by over a thousand chemists, both in Great Britain and in many other countries throughout the world. These products consist of standard analysed samples covering a large variety of materials, including a series of carbon steels, several alloy steels, several cast irons, including hematite, high-duty and phosphoric grades. There is also a series of non-ferrous standards, including high- and low-tin content white metals, manganese brass, cupro-nickel, aluminium alloy and phosphor-bronze.

Each sample is carefully standardised by a number of well-known chemists, including several abroad, representing the principal interests, *e.g.*, manufacturers, users, railways, government departments and independent analysts. Typical bottles of the finished standards will be exhibited to illustrate the fine condition of the material and the great precautions taken to ensure its homogeneity. Typical certificates, which are issued with each bottle of standard material, will also be shown to illustrate the way in which full details of each chemists' results are given, together with an outline of the methods employed.

In addition to the usual standard samples, a new series of standardised reagents and metals of a high degree of purity have been specially prepared for use in volumetric analysis, calorimetry and pyrometry. Specimens of these, such as benzoic acid, sodium oxalate, tin, lead, etc., are being exhibited.

The Analoid system of analysis aims at standardising and simplifying methods. This process was first introduced nearly 25 years ago, and has been very considerably developed and improved during the intervening period. It is essentially designed for routine works tests, but the high degree of accuracy attained has resulted in it becoming adopted in a number of research and independent laboratories. It is applied to the determination of phosphorus, manganese, chromium, vanadium, lime, copper, etc., in a large range of metallurgical materials, including cast iron.

The methods are so simple and short that arrangements are being made to have them demonstrated so that all who are interested may see actual tests, such as the determination of phosphorus, manganese, chromium, etc., in steel and cast iron. This is a novelty which has never been introduced previously to a Foundry Trades' Exhibition. Messrs. Ridsdale & Company have been closely associated with moulding-sand testing for some years, and it is therefore appropriate to find that they are supplementing their other exhibits with several pieces of apparatus which they supply for making rapid routine-



Sand-Testing Apparatus on the Stand of Ridsdale & Company.

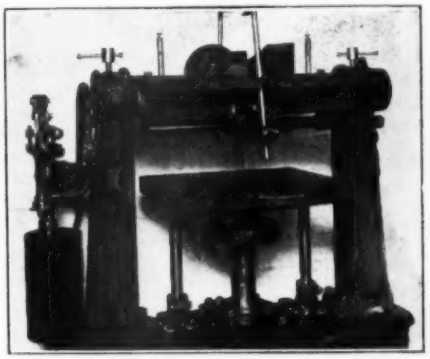
control tests of green stand. Arrangements are to be made for these tests to be demonstrated in view of the increased interest founders are taking in this subject. The personnel of their stand consists of Mr. N. D. Ridsdale (manager) and Mr. H. Piper.

British Moulding Machine Company, Limited, of 237, Weston Street, London Bridge, London, S.E.1, show a completely new line of foundry equipment, included amongst which are the following:—

Snap Flask Machine.—This machine has been designed specifically for snap flask work, where both halves of the mould are cast at the same time. The machine consists of a base, pattern table and presser head, which are mounted on a steel column. This column is machined the whole length, and permits raising and lowering of the pattern table and the complete presser head, of which the greatest advantage is that the moulder can set the table at the height which he finds most convenient, and it also gives an extra adjustment for deep boxes. The presser head has an adjusting wheel which regulates the height of the presser plate. The machine is fitted with a side shelf which accommodates the riddle and the top half of the box, making a compact unit, and giving the minimum number of motions for the making of the mould.

"*Easiram*" *Squeezer Head.*—The "Easiram" has a presser head similar to the snap flask machine. This presser head is mounted on a bracket which can be fastened to the wall or fitted over benches, troughs and hand-ram machines, and thus fills a long-felt want in the foundry.

Hand-Squeeze Turnover Moulding Machine.—This machine consists of a turnover table sup-



Hand-Hydraulic Moulding Machine by British Moulding Machine Company, Limited.

ported by two accurately-machined trunnions fitted to a base plate containing the draw-table mechanism. The draw table is operated by a counterweighted lever on the left, and the draw guides work in very long bearings underneath which are screwed cylinders filled with oil. Each time the guides are lowered they are immersed in oil, which also resists the guides and gives a perfect draw without a semblance of chatter. The squeezer head is fitted to a column at the back of the machine, and has an adjusting wheel for setting the height of the presser plate.

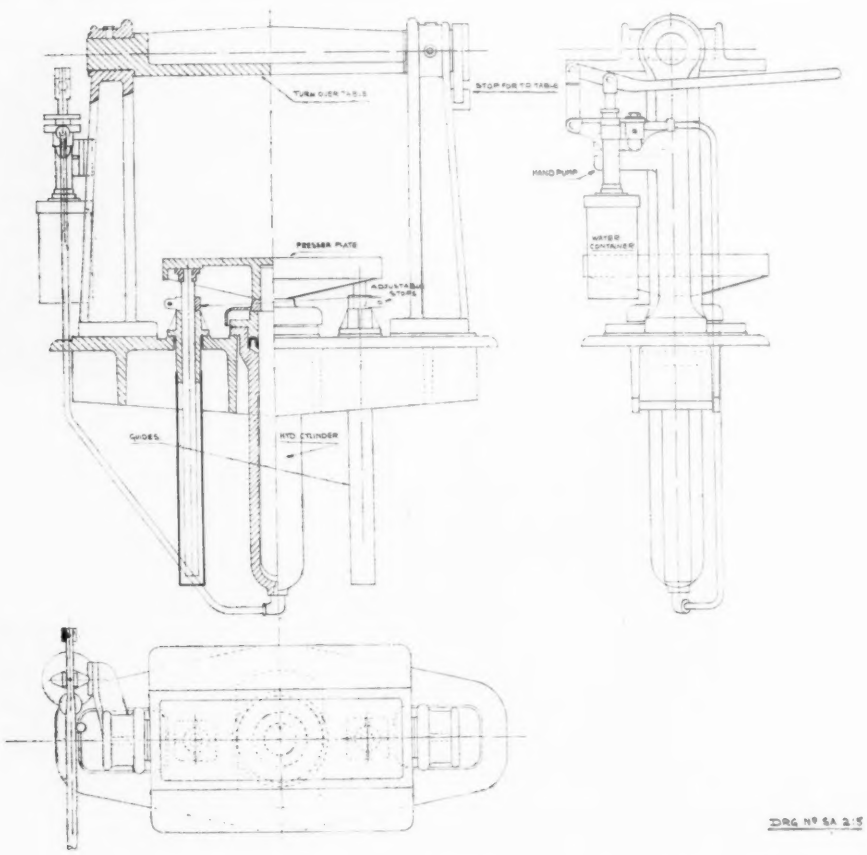
Duplex Hand-Squeeze Turnover Moulding Machine.—Our ordinary turnover hand-squeeze machine set up in duplex form, as it has been found that there is a considerable demand for this type of machine. It means that the unit is considerably cheaper than the purchase of two machines, and that two operators can work with one presser head, one making tops and one making bottoms. One side of the machine can be

Hand-Squeeze Turnover Machine by British Moulding Machine Company, Limited.

of the turnover type and the other side of the straight-draw type.

Hand Hydraulic Moulding Machine (*Turnover*).—The essential in a moulding machine is that the operator has to expend the minimum amount of energy and make the minimum number of operations. The hand hydraulic machine

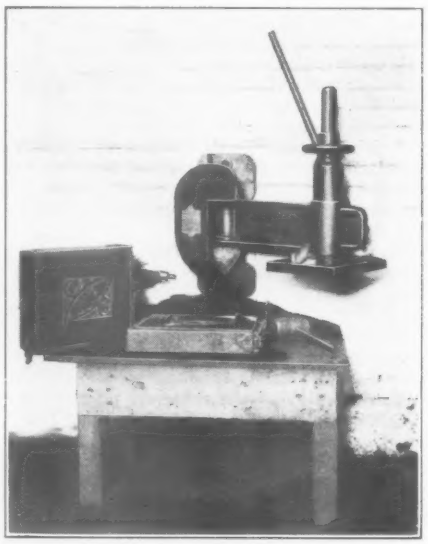
has been designed in an endeavour to fulfil these requirements. It is usual in hand-operated machines to have a swinging head which accommodates the squeezer mechanism. This means that the mould is squeezed and then turned over, when the moulding box has to come into contact with another table for lowering the mould away from the pattern. With the hand hydraulic machine there is no swinging-head squeezer mechanism, but when the box has been filled with sand, and a bottom board placed in position, the whole is turned over, and the draw table is brought into contact with the bottom board, and the mould squeezed by the simple action of pressing down a hand hydraulic pump. As the pressure is put on the bottom board, the clamping device is automatically released, leaving the mould free for lowering away, which can be regulated by the rate in which the water from the ram is allowed to return. It will be readily appreciated that the energy expended and the time taken to make a mould on this machine is very small.



Hand-Operated Hydraulic Moulding Machine by British Moulding Machine Company, Limited.

Gyratory Riddle.—Is made up of a semi-triangular steel frame at the top of which is housed a ¼-h.p. motor, which can be wound for any current. The spindle of the motor is connected by a coupling to a shaft which operates an eccentric flywheel, and the bottom end of the shaft is supported in ball bearings contained in a cross member of the frame. The riddle is hung from the bottom of the frame, and is easily detachable from its holder, while if of ¼-in. mesh it will pass one ton of sand through in 5 to 7 min. The power consumption is negligible and the whole unit can be fitted with a sheave pulley for travelling along a cable or a carriage for travelling on a girder.

Facing-Sand Hopper.—It is an undisputed fact that in machine moulding the riddling of the facing sand on the pattern is the most fatiguing operation in the making of the mould. It is also the operation which invariably takes most time. Facing sand is expensive, as it has to be specially prepared, and transported to the moulding machine. Up to now the facing sand is passed through a circular riddle by hand, and a considerable amount of sand is lost or misses the box and falls on the floor. With the new sand hopper exhibited the energy required and the time taken to riddle the sand on the pattern is negligible. The riddle being rectangular in shape, more or less conforms to the box, and there is practically no wastage of facing sand. The hopper can be made to suit the individual requirements of the founder, and there are various means available for keeping the hopper supplied with sand. The riddle is mounted on a runway, and is pushed into position over the box by a handle. Immediately it is in position it automatically opens an air inlet which starts the vibrating action, and the sand passes on to the pattern. When sufficient sand has been riddled, the handle is released, the riddle returns, and in doing so opens a valve in the bottom of the hopper, which feeds a predetermined amount of sand into the riddle ready for the next operation. Full details of Bentonite will be available on this stand.



The Easiram Squeezer Head by British Moulding Machine Company, Limited.

The personnel of this stand is as follows:—Mr. W. Tait, managing director; Mr. V. Cashmore, outdoor sales representative; Mr. H. C. Hamlin, staff; Mr. P. Egerton, staff; Mr. C. Campbell, demonstrator; and Mr. A. Ireland, mechanic.

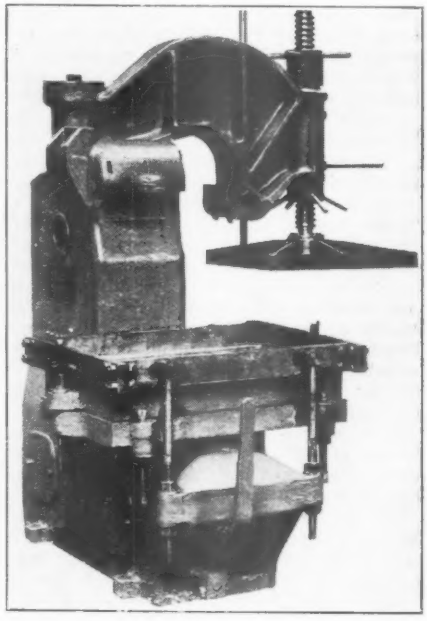
Moulding Machines.

Foundry Equipment, Limited, of 15, Victoria Street, Westminster, London, S.W.1, are showing a range of machinery never previously shown at any exhibition. In fact, most of it has just left the test beds, where it has undergone the most strenuous practical tests. Amongst the principal exhibits are to be found the following:—

(1) Special new-type hydraulic pump.

(2) In connection with above, a new-type air-loaded accumulator.

(3) Small air compressor and receiver for working the C.A.I. moulding machine.



FE2 Hydraulic Plate-Moulding Machine by Foundry Equipment, Limited.

(4) Special types of slip flask and pouring jackets.

(5) A range of moulding machines, all of which are entirely novel and covered by patent applications.

(*a*) C.A.I. compressed-air jolt-squeeze machine for working with snap flasks.

A.B.3, hand-pressure moulding machine, fitted with pattern drawing arrangements.

T.2, hydraulic roll-over moulding machine, fitted with special vibratory action and special under-sand frame.

P.D./3, straight-draw hydraulic moulding machine, fitted with special-type under-sand frame.

F.E.2, straight-draw moulding machine, specially built for stove-plate work, fitted with special under-sand frame.

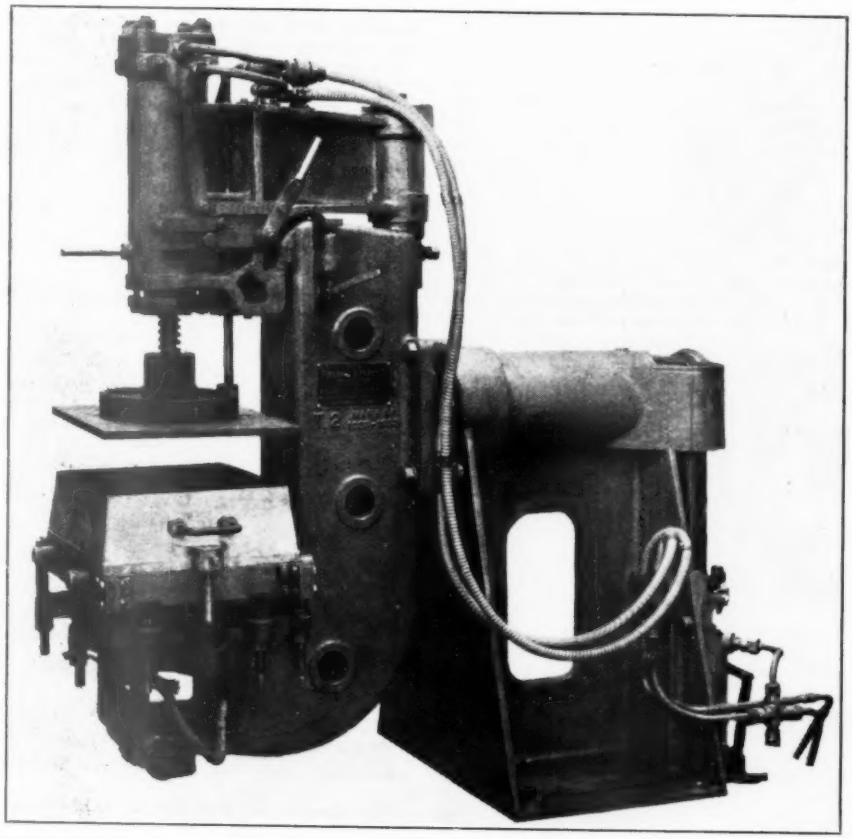
A.B.H.T.90, new-type two-station rotary hydraulic moulding machine fitted with special-type under-sand frame, and some small sundries such as vibrators, flowing-off nozzles and various electric and pneumatic tools. A section of the firm's latest type of mould conveyor completes this section of the exhibit.

(6) Special compact sand plant, consisting of riddle, elevator, sand-batch feeder, sand mill and disintegrator, all built into one unit.

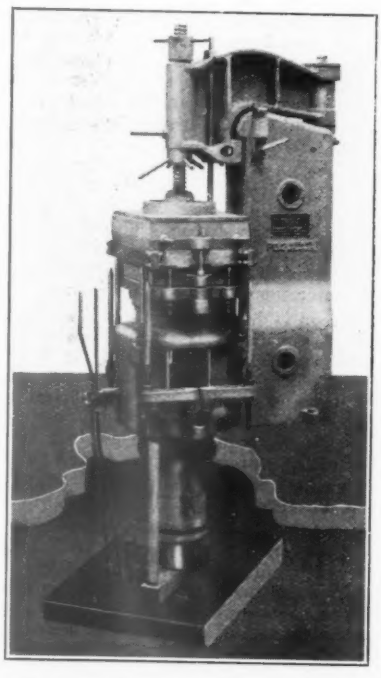
All the machinery shown is being manufactured in Great Britain, and, in fact, most of it is of entirely new design since this company was formed, and will be shown for the first time in any country.

The firm has inaugurated a special service department, which has never existed in the foundry industry previously, and are prepared to undertake the manufacture and supply of pattern plates, stripping plates and core boxes, without any machining being necessary for use on any other types of machines on which these particular pattern plates can be mounted; to supply metal already blended to correct analysis and sand for making pattern plates; to supply the necessary tackle to enable founders to make their own pattern plates, stripping plates and core boxes in metal without machining, and to instruct the personnel in clients' works how to use such tackle to the best advantage. The erection, starting up and demonstration of installations, whether these be of a pure moulding nature, sand preparation or reconditioning or continuous casting; and to be entirely at the service of founders in the case of breakdown.

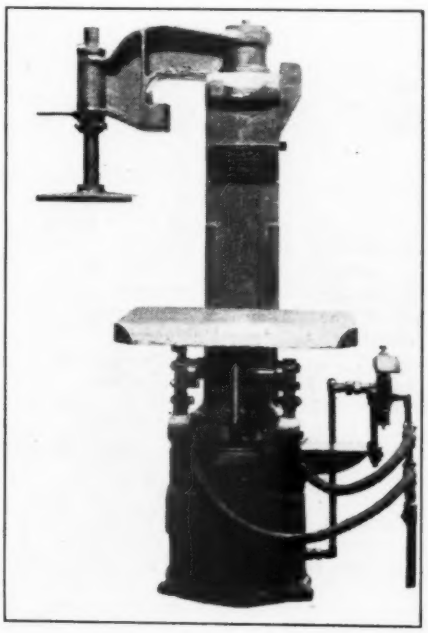
The personnel of the stand includes:—Mr. J. B. Corrie, chairman; Mr. A. G. Corrie, director; and Mr. A. S. Beech, managing director.



T2 Hydraulic Roll-Over Moulding Machine: Moulding-Box in Position before Ramming, by Foundry Equipment, Limited.



PD2 Type Hydraulic Machine fitted with Under Sand Frame, by Foundry Equipment, Limited.



CA1 Compressed-Air Jolt Squeezer Machine, by Foundry Equipment, Limited.

Scientific Instruments.

E. Leitz (London), Limited, 20, Mortimer Street, London, W.1, have as their principal exhibit a Leitz large metallographic microscope MM. This is a new model, of substantial construction, with vertical illuminator with glass plate and prism on one spindle, easily interchangeable, and also dark ground illuminator for the observation by conical illumination. This new illuminator enables one to investigate the polished metal surfaces in their natural appearance and brings out inclusions in their natural colour. For instance, it will show up cupreous oxide crimson and cupreous sulphide bluish-grey, whilst with the ordinary vertical illuminator both constituents in copper appear the same bluish-grey. The dark ground illuminator is further useful for the investigation of steel for inclusions.

The ideal arrangement enables one to investigate the same portion of specimen by either mode of illumination, the objective staying in focus whilst changing over from one to the other. The dark ground illuminator yields an image free from glare and haziness, as the illuminating beam does not pass through the lenses but around them. The image is actually formed by the light scattered at the structure of the specimen, and it is therefore the reverse of the ordinary image, where the structure is dark on a light background.

The design of the microscope makes for easy manipulation and offers great conveniences to the research and routine worker who has to do a great number of tests daily. In its new chromium-plated finish it will keep its appearance under the most adverse atmospheric conditions.

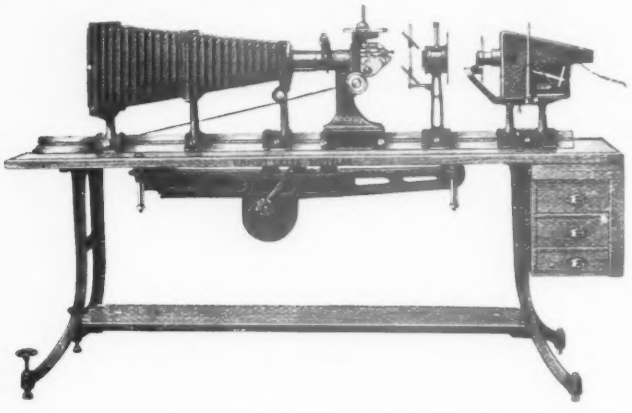
An effective resilient vibration-absorbing device enables one to take photomicrographs even with 1,000 or more magnifications in laboratories adjoining machine shops or next to railway lines or steam hammers. No vibrations whatever will affect the focus and the photograph will be perfectly crisp and sharp, even under such adverse conditions as those mentioned.

The MM Microscope is also sometimes equipped with an arrangement for polarised light, which has only lately been more frequently applied for metals. The polarising outfit is not an attachment, but has to be embodied from the outset. It makes the Metallographic microscope a proper

polarising microscope for reflected light. The camera is provided for ¼ and ½ plates, upright or horizontal, and a mirror attachment to the back of the camera enables one to focus conveniently without leaving the seat at the lateral eyepiece of the microscope.

A special binocular body enables one to do metallurgical microscopy with both eyes—a convenience which has not been offered hitherto. This body, which is built so as to give a stereoscopic effect, makes the structure of the specimen stand out clearly and avoids the usual flat appearance of the image. This important development—the binocular metallurgical microscope—avoids eyestrain and fatigue and increases the efficiency of the man in the laboratory considerably.

Leitz Optical Dilatometers.—Two models are shown—the differential and the universal model. The differential dilatometer as exhibited is an adjunct to the large metallographic microscope in as far as it utilises the same optical bench and camera. The dilatometric method of thermal analysis fulfils the following requirements:—(1) Changes occurring in a metal at a very slow or very rapid rate can be brought within range of observation; (2) by use of appropriate means of amplification (mechanical-lever transmission or optical magnification) very small changes in dimensions may be rendered distinctly visible; (3) both reversible (allotropic points) and irreversible changes (internal strains, swelling of cast iron, phenomena arising in the act of refining) can be observed; (4) experimental data can be expressed in quantitative terms; (5) all solid materials used in construction, such as steel, iron, other metals and alloys, ceramic building materials, minerals, glass, etc., can be examined within the temperature range of from 20 to 1,150 deg. C.; and (6) due to the practicability of applying variable rates of amplification, very small test-pieces of standard of length of 50 mm. and 3 to 4 mm. dia. can be tested, whilst it is even practicable to test specimens only 10 to 15 mm. long.



Leitz Metallographic Microscope MM., by E. Leitz, Limited, London.

The balance of the exhibits is made up of a small metallographic microscope MM; materials testing microscope; ring illuminators; colorimeters; binocular magnifiers; grinding and polishing machines; ore-dressing microscope; hand spectroscope.

The first factory for the Bata Shoe Company (British), Limited, at East Tilbury, Essex, is welded throughout. The building is 260 ft. long and 62 ft. wide, and contains 56 stanchions and 14 roof trusses. The stanchions are constructed of 3⅞ in. by 2 in. by ¼ in. channels, the roof trusses of 2¾ in. by $\frac{5}{16}$ in. T bars and the lattice bracings on the trusses are 1½ in. by $\frac{7}{32}$ in. All steel windows are fitted throughout and are welded into the main framework.

Foundry Exhibition.

(Too late for Classification)

The Workington Iron & Steel Company, branch of the United Steel Companies, Limited, are showing at the Foundry Trades' Exhibition a comprehensive selection of their various brands of pig-iron. In "Workington" and "Distington" hematite irons there is a range of hematite pigs made from pure Cumberland ores, including qualities having sulphur and phosphorus content below 0.02, 0.025 and 0.03 per cent. There are also Workington and Distington irons of ordinary qualities, and special high-manganese irons (2.0 to 3.00 per cent. Mn). Workington refined irons and also "D.T.N." irons are shown in the form of small pigs suitable for the malleable-castings trade, a range of grades from white to grey being exhibited.

In addition, there is a complete range of the now famous "UCO" irons, both in the "MW" grades (suitable for malleable castings) and the "W" grades for cylinders and all other strong castings. "UCO" irons are supplied in the form of medium-sized sand-cast pigs, made entirely of virgin West Coast hematite materials, the carbon percentage not being achieved by remelting or dilution with steel scrap. "UCO" irons are not, therefore, to be confused with synthetic or "refined" irons. The low-sulphur content is the result of the ores used, and not achieved by "desulphurisation." Analyses are guaranteed, and each consignment is accompanied by an analysis and is consistent throughout.

In addition to their own exhibits, the Workington Company are showing at their stand a very wide range of castings of all types, steel, cast iron and malleable, iron, made from their iron by various customers, which include some very well-known names, amongst whom there are:—Edgar Allen & Company, Limited, Sheffield; Audley Engineering Company, Limited, Newport, Shropshire; Austin Motor Company, Limited, Birmingham; Bakers' Foundry Company, Limited, Smethwick; British Northrop Loom Company, Limited, Blackburn; John Fowler (Don Foundry), Limited, Sheffield; Galloways, Limited, Manchester; A. T. Green & Sons, Limited, Rotherham; Guest & Chrimes, Limited, Rotherham; Hargreaves & Jennings, Limited, Tottington, Bury; Harrisons' (Lincoln), Limited, Lincoln; Hopkinsons, Limited, Huddersfield; Hopyard Foundries, Limited, Coseley; P. R. Jackson & Company, Limited, Manchester; John Milburn, Workington; A. H. Mould & Sons, Limited, Walsall; Walker Castings, Limited, Sheffield; and W. Woodcock, Sons & Company, Limited, St. Helens.

The Edgar Allen-Allis-Chalmers Centrifugal Vibrating Screen.

Designed for screening and sizing lump and granular substances, such as crushed stone, ore, coke, coal, etc., the screen illustrated, which is built by Edgar Allen & Company, Limited, of Sheffield, is of very simple mechanical construction and consists of three principal parts.

The supporting frame is built up of two heavy "I" beams rigidly fastened by cross ties, which are electrically welded together. The screen body or vibrating member, which is made up of steel-plate sides, cross connected by steel members welded to the side plates. The connection of the screen body to the vibrating mechanism is through two heavy steel angles riveted and welded to the side plates, and the vibrating mechanism, which consists of a heavy steel shaft is carried in oversize roller bearings mounted on the supporting frame in self-aligning dust-proof housings. Mounted upon the shaft, just inside the supporting frame and protected by steel housings, are two heavy balance wheels. Between these balance wheels the shaft is turned eccentric for a short distance for the vibrating screen body bearings, which are of the roller type and carried in self-aligning dust-proof housings.

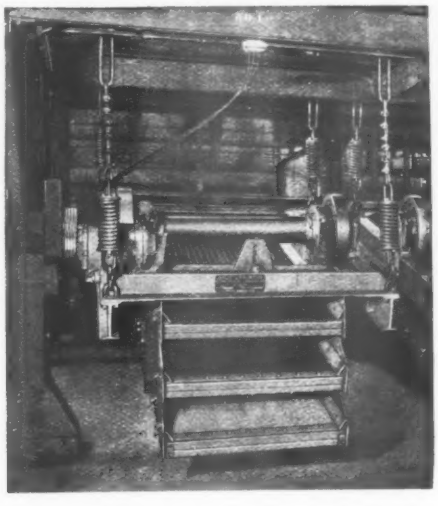


Fig. 1.—The Edgar Allen-Allis-Chalmers Centrifugal Vibrating Screen.

It will be seen that the centrifugal vibration motion is positive, mechanically produced, and, due to the method of attaching the vibrating mechanism to the screen body, the vibrating motion is equal over the entire screen surface. The screen is driven by a totally-enclosed fan-cooled motor mounted on the stationary frame.

The screen is driven from the motor through a Texrope, a multiple V-belt, which was originated and developed by Allis-Chalmers. It is slipless, vibrationless and flexible, unaffected by dust or even water and requires neither lubrication nor dressing. The screen is built with one, two or three decks, as required. The mesh surfaces, when made of woven wire, are bolted to frames of welded-steel construction, which are arranged to be removed and replaced quickly.

For certain classes of work there has been developed a combination holding-and-tightening device which eliminates entirely the use of the frames referred to. The screen cloth is attached to holding members on each side, which are held in tension by spring clamp plates bolted to the screen body. With this arrangement the cloth is supported by one or more longitudinal rubber-covered supports running lengthwise of the screen and the cloth is held in tension by the clamp plates.

The Foundries of Messrs. S. Russell & Sons, Limited.

By Vincent C. Faulkner.

There are but few foundry concerns in Great Britain which possess more features of interest to our readers than this well-known Leicester firm. It was established in 1864 by the father of the present chairman of directors in a small shop in the middle of the (then) town as a brass foundry only. The first portion of the present site was bought in 1883. S. and W. F.

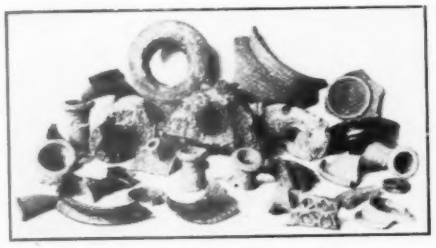


Fig. 1.—Shards found in the Floor of Messrs. S. Russell & Sons' Foundry.

Russell then being of an age to become partners, the firm became known as S. Russell & Sons until 1931, when it became convenient for family reasons for the firm to become a limited company. The foundries are managed by Mr. S. H. Russell—a Past-President of the Institute of British Foundrymen, and Mr. P. A. Russell, B.Sc., who is an extremely active member of that association. Other members of the family control the structural-steel and engineering departments. The Bath Lane works have been extended from time to time, and five or six different portions of the present site of about 1¾ acres have been purchased as they became available. The works are on the banks of the River Soar, and a very considerable quantity of shards were unearthed during the excavations for the building of several of these shops, many of the better pieces being retained for inspection at the works, and some of them are illustrated in Fig. 1. Shortly before the firm acquired these premises a large tesselated Roman pavement was discovered on the site, indicating that a substantial Roman villa once stood there. This pavement was carefully lifted and is now fixed intact in the City Museum.

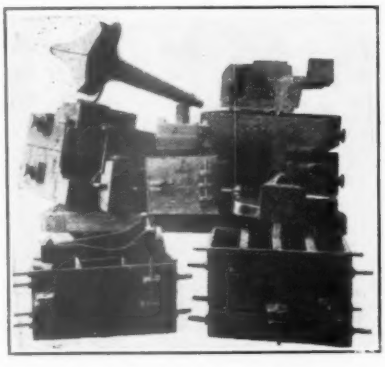


Fig. 2.—A Group of Moulding Boxes designed for the Elimination of "Joints."

Within a few hundred yards of the works there are many other remains of great historic interest, such as a long stretch of Roman Wall, two beautiful tesselated pavements "in situ," and the Great Hall of Simon De Montfort's Castle.

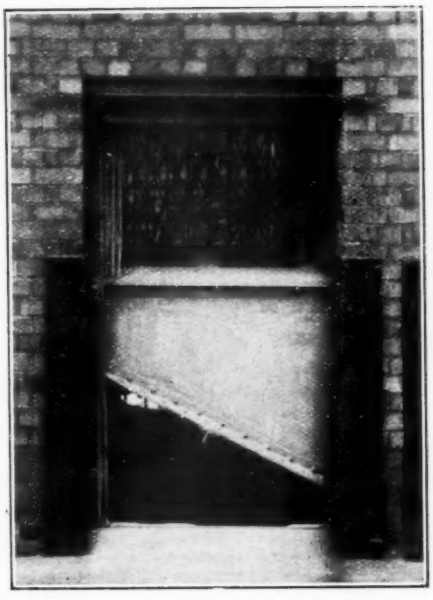


Fig. 3.—Shows the Method of Transporting Coke to the Cupola Stage by an Adaptation of the Hoist.

Possibly because the Bath Lane works, owing to its growth by absorption of contiguous shops, is difficult to organise from the modern "production" point of view, it has excelled itself in its commercial business methods. For instance, a combination of coloured lights appears in the offices and shops to indicate that an executive officer is required on the telephone, attention being called to the indicator by a siren. Then the system of dealing with orders is well worth

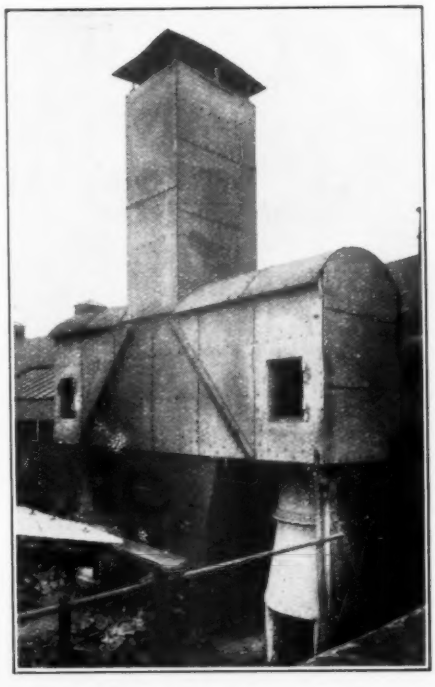


Fig. 4.—Spark Arresters.

emulation by other foundries. All records are entered on cards carried in three trays mounted on wheeled carriages, which are designed to fit snugly overnight in a fireproof strong room. During the day they are arranged around a clerk, who enters upon them every scrap of information, both technical and commercial. Then, by means of coloured tags and positioning, the clerk can control processing and delivery and what is more important, provide information as to difficulties which have been encountered in the past with any particular pattern and the means to be taken for their avoidance in the future.

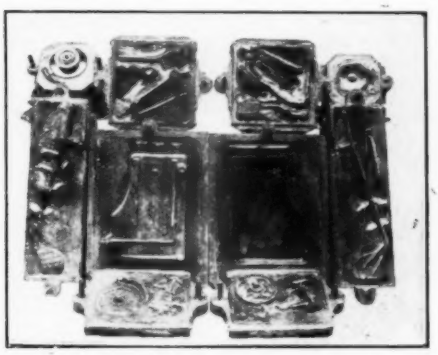


Fig. 5.—A Group of Pattern Plates made in some cases for quite modest Orders.

Technical Features at Bath Lane.

In general, the heavier work is carried out at Bath Lane, the lighter castings being made at the branch foundry at Bonchurch Street, except in cases where the quantity is less than two dozen or that the job is incapable of being machine moulded. The outstanding feature at Bath Lane to our mind is the intensive effort that has been made over years to eliminate multiple joints, with the result that there is the most extraordinary collection of moulding boxes we have seen in any foundry either at home or abroad. The policy of the firm has been for a long time that if there is any reasonable chance of repeat orders, then a special moulding box has been made in order to eliminate much useless donkey-work, to reduce the joints to a minimum and to economise valuable moulding floor space. We illustrate in Fig. 2 a small collection of these moulding boxes, together with the patterns they are designed to accommodate.

Another factor which presents features of interest to the foundry industry is the method

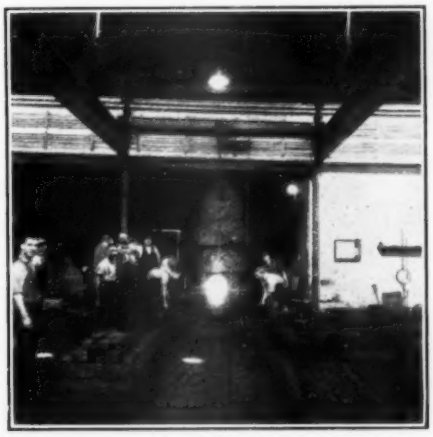


Fig. 7.—Cupola Metal can be handled by Crane, Floor Ladles or Hand Shanks.

of handling coke to the cupola stage. It is shown in Fig. 3. On arrival by lorry, the coke is loaded into a container made available by opening the floor plates of the elevator cage. The lift shaft has been carried distinctly higher

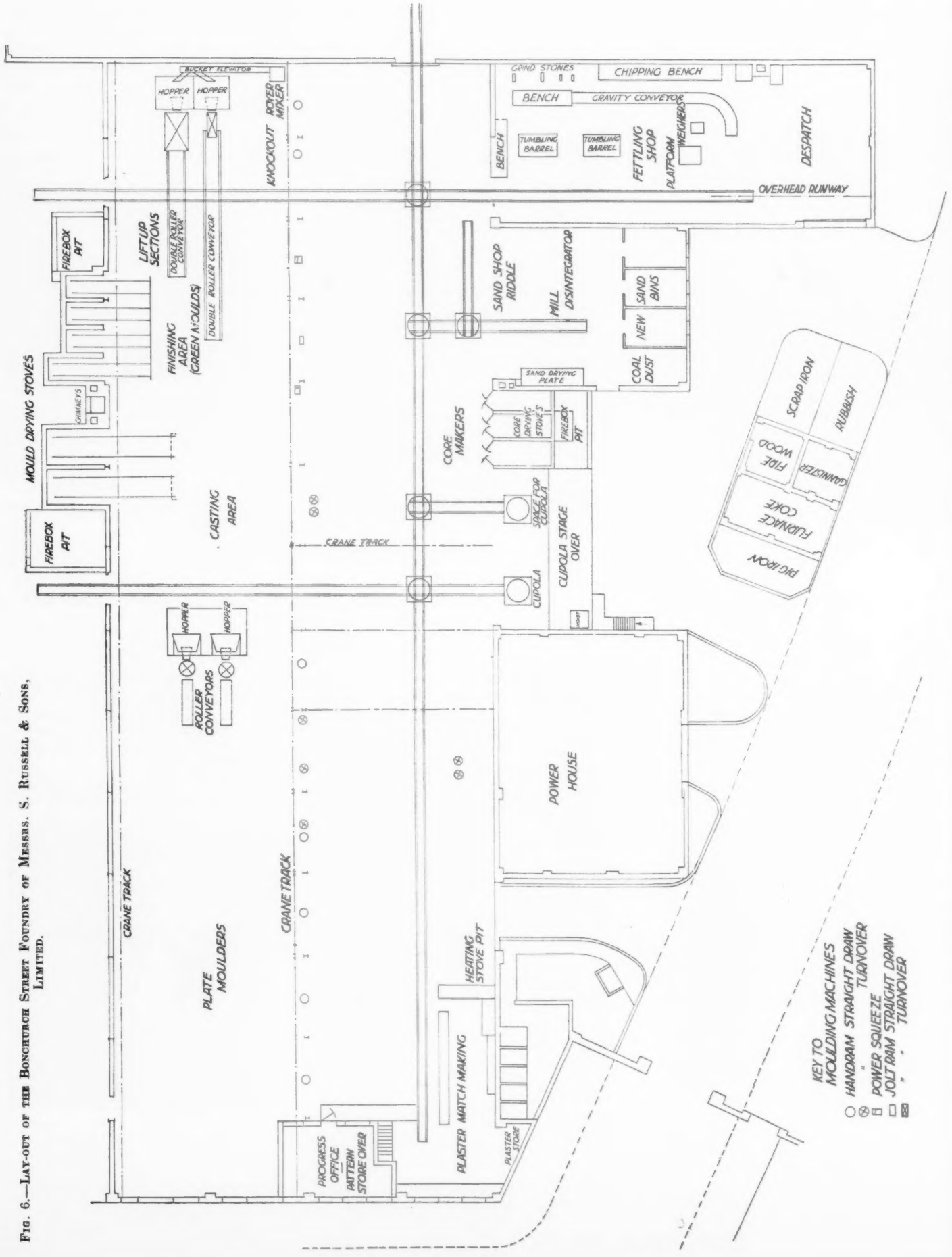


Fig. 6.—Lay-out of the Bonchurch Street Foundry of Messrs. S. Russell & Sons, Limited.

than the charging stage, and push-button control allows the cage to take up such a position that the container beneath it can discharge by gravity its burden of coke direct upon the cupola platform at the side of the cage exit. It is the practice at Bath Lane to use the daily arrivals of coke on receipt, and to carry a stock on the cupola stage for use in case of emergency.

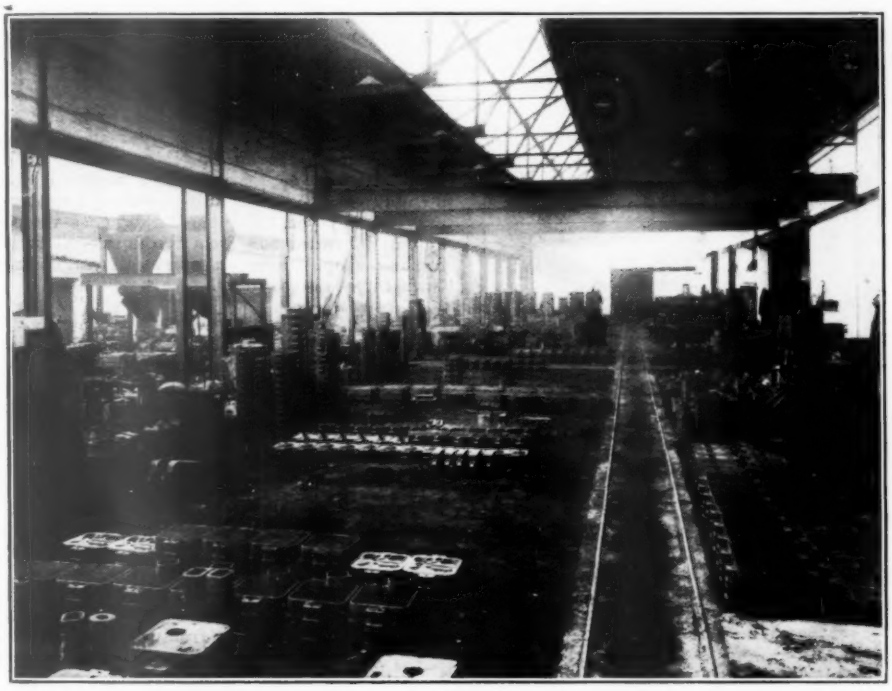


Fig. 8.—General View of the Foundry of Messrs. S. Russell & Sons, looking from the Pattern-Plate Section.

In view of Mr. Greenwood's recent outspoken comments on spark arresters, we were particularly interested in the one installed in this foundry, as it has been designed and made in their own shops and has also been supplied to other foundries. It is illustrated in Fig. 4 and consists of a firebrick-lined chamber with two simple baffles arranged to deflect the sparks into the hopper below. This has been in daily use for over 21 years. Apart from regular painting externally, the only expense in maintenance has been in occasional renewal of parts of the firebrick lining and (after 20 years' service) the replacement of a few of the plates.

An examination of the surrounding gutters was eloquent tribute as to its effectiveness.

Non-Ferrous Foundry.

The firm of Russell can be taken as representative of modern tendencies in foundry practice, and we were not surprised to learn that their 400-lb. Morgan tilting crucible furnace, installed in the non-ferrous shop, was being used for the production of alloy cast iron, such as Silal and Nicrosilal. Thus we see the old lines of demarcation being broken down and plant originally designed for steel or non-ferrous, as in this case, being brought into grey-iron foundry practice. In addition to the Morgan tilter there is a battery of pit fires in this department, which regularly turns out a complete range of bronze, brass and light-alloy castings. Morgan's super-crucibles are used, which on Admiralty gun-metal give 90 to 100 heats.

The Bonchurch Street Foundry.

While the construction of special moulding boxes to eliminate excessive jointing is the feature at Bath Lane, the speciality at Bonchurch Street is the mounting of patterns on plates even for quite small quantities of castings. Typical plaster patterns are shown in Fig. 5.

The lay-out of the foundry is illustrated in Fig. 6, and presents considerable interest, as it shows how mechanisation has been incorporated on a scale easily reproducible by a large number of medium-sized foundries. For jobbing foundries the great essential to bear in mind is elasticity. This factor is immediately disclosed in the handling of the liquid metal from the cupola, where electric overhead travelling cranes, bogie-ladles and hand-shanks are all used (Fig. 7). At this point it seems appropriate to refer to the methods used for conserving the alloy additions used for special irons. As is well known, even though double quantities of coke be used for separating "special" from "ordinary" charges, there is always a certain amount of migration. Thus, the practice at Bonchurch Street is to pig the adjacent charges and to incorporate these on the following day in the actual special mixes. By this means it has been found possible to institute an extremely accurate compositional control, as migration is virtually constant. A further aid to compositional control is the invariable use of a balance which has its dial reversed in the illustration.

Sand Preparation.

New sand is emptied from lorries direct into bins through hatches in the shop wall. Old sand enters the sand shop in wheeled bogies and is freed from refuse by riddling through an oscillating "adaptable" sieve. Old and new sand and coal dust are mixed in an ordinary pan mill and after putting through a disintegrator of the Herbert type is ready for transport to the various moulding stations. The backing sand, to the amount of perhaps 100 tons a day, is put through a Pneulec-Royer disintegrator. Incoming silica sand for core-making is dried on a plate in the sand shop, heat being provided by an extension of the outgoing flues from the contiguous core-drying ovens.

The Mechanised Section.

In any criticism of the lay-out of this section, it must be borne in mind that much of the output of the foundry has to be made in dry-sand moulds, as will be gathered from the fact that six ovens covering an area of 262 sq. ft. are necessary to deal with it.

From Fig. 9 it will be seen that at the end of the drying-stove bay, sand from the knock-out is fed through a Royer into bucket elevator, which fills one of two hoppers. A butterfly valve, which is chain-controlled from the ground, is used to change the stream of sand from one to the other. These hoppers are placed immediately above the Tabor jolt-ram turnover machines. The half-moulds on completion are pushed out of the way on a gravity-roller conveyor, at the end of which the overhead crane —a 2-ton Royce—transfers them to the carriages of the mould-drying stoves.

Fig. 9.—Showing the Simple Character of Mechanised Section of the Foundry of Messrs. S. Russell & Sons, Limited.

Further down the shop, but in the same bay,

a further two hoppers have been erected. They are shown in Fig. 10. These, however, on account of lack of headroom, cannot be bucket-elevator-fed, and thus skips, such as are shown

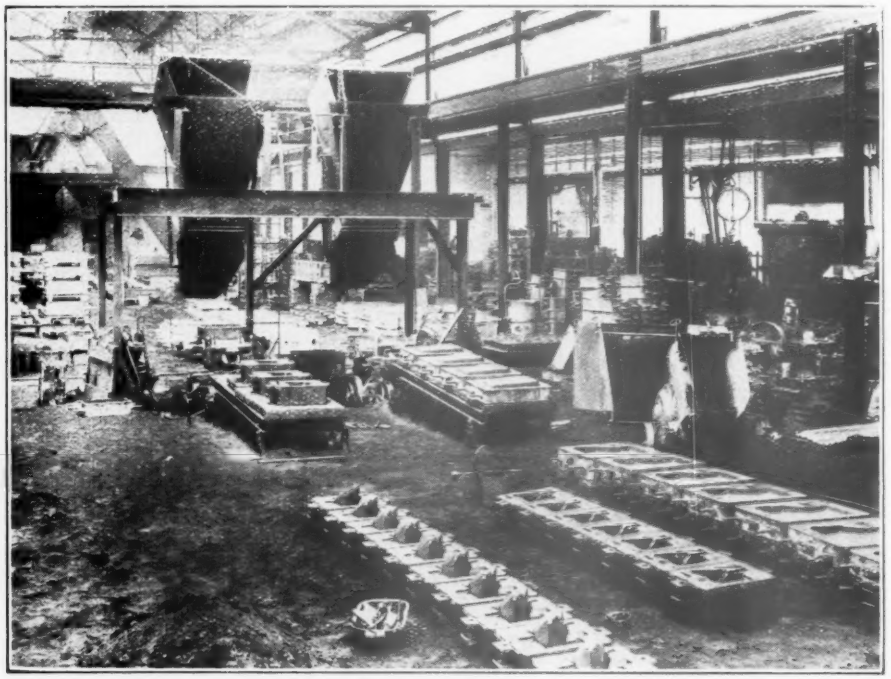


Fig. 10.—A Moulding Station supplied with Overhead Sand Hoppers.

at the right-hand side of the plant, are filled by the Royer and taken by the crane to fill the storage hoppers. The machines, beneath the hopper, hand-ram turnover type, deal with work of a somewhat lighter character than that made on the Tabor. Thus there has been achieved in the simplest and cheapest form a method

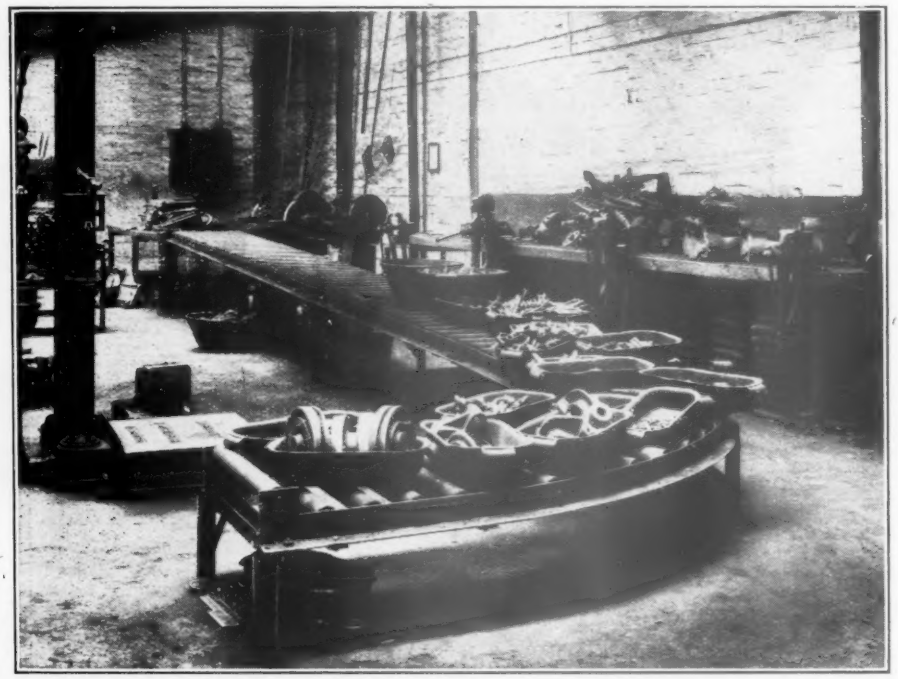


Fig. 11.—The Fettling Shop is served by a Roller Gravity Conveyor.

of mechanisation which has, while preserving a maximum amount of elasticity, taken the major part of the donkey work out of moulding methods. The next step envisaged is the mechanisation of the knock-out—a comparatively simple matter. The management had the co-operation of the Pneulec Company in the design and lay-out of the plant served by bucket elevators, the other hoppers being designed and made in their own works.

Drying Stoves.

Until there is available an infallible method of stating the efficiency of drying stoves, writers must be content to express personal opinions, based on generalities. The stoves, which, by the way, are home made, we deem to be efficient on the following grounds:—(1) The stoves are splendidly insulated. The roofs are flat and are made from suspended insulating bricks; (2) the doors are well insulated and are made to close tightly by means of pressure of eccentric discs; and (3) a rough correlation of weight of moulds drying time, moisture content, diminution and coke consumption, satisfied us as yielding better results than the average stove.

Fettling Shop.

The fettling shop, which is conveniently placed at the exit, is, as will be seen from Fig. 11, particularly well laid out. Small castings, whether they are to be chipped, ground or rumbled, are in general kept waist-high on account of the centrally-disposed length of gravity conveyor. For the larger ones there is a straight railed run from the knock-out to the fettling shop, where an overhead can transfer them direct to the lorry.

Conclusions.

It will be seen from an examination of the lay-out (Fig. 6) that the very best use has been made of the triangular nature of the ground built over. The positioning of the cupolas, the drying stoves, the knock-out, the sand plant and the fettling shop have combined to reduce transport movements to a minimum. Finally, we sincerely thank the management, especially Mr. S. H. Russell and Mr. Philip Russell, for the facilities accorded to us in the preparation of this article and to congratulate them on the efficiency of their works.

The company has definitely adopted the policy of purchasing all pig-irons by specifying the analysis rather than the fracture, and definitely grade all their iron castings so that they will be produced in an iron containing a suitable silicon and phosphorus content, four standard mixtures being regularly drawn from the cupola daily.

They are licensed manufacturers of Silal and Nicrosilal and also produce a variety of alloy cast irons for many purposes, particularly having heat-resisting, high-tensile or hard-wearing properties.

American Foundrymen's Association.

The Appropriate Committee of the American Foundrymen's Association has nominated the following officers and directors:—*President to serve for one year:* Mr. Frank J. Lanahan, President, Fort Pitt Malleable Iron Company, Pittsburgh; *Vice-President to serve for one year:* Mr. Dan M. Avey, Editor, "The Foundry," Cleveland; *Directors to serve three-year terms each:* Mr. George Batty, Technical Director, Steel Castings Development Bureau, Narbeth, Pa.; General T. S. Hammond, President, Whiting Corp., Harvey, Ill.; Mr. R. J. Teetor, General Manager, Cadillac Malleable Iron Company, Cadillac, Mich.; Mr. R. F. Harington, Metallurgist, Hunt-Spiller Mfg. Corp., Boston, Mass.; and Mr. J. L. Wick, Jr., President and General Manager, Falcon Bronze Company, Youngstown, Ohio; *For a one-year term:* Dr. H. Ries, Cornell University, Ithaca, N.Y., Technical Director, Committee on Moulding-Sand Research.

Porosity and Aluminium Castings.—When an aluminium casting is found to be porous, but not bad enough to be rejected, the porosity may be cured as follows:—A strong solution of silicate of soda is made up, and this is forced under pressure into the casting. The casting is then removed and force-dried in an oven at about 60 deg. C. This causes the silicate of soda to react, forming aluminium oxide, which effectively clogs the pores and cures the porosity. Painting with linseed oil or a suitable lacquer will to some extent cure porosity. Previous to being painted, the surfaces should be sand blasted.

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Sulphur	·02%	·02% to ·04%
Phosphorus	1·6%	·5% to ·8%
Manganese	·3% to ·4%	·7% to 1%

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Mechanised Core Shops.

At a meeting of the Sheffield Branch of the Institute of British Foundrymen, Mr. C. D. Pollard presiding, Mr. H. F. Coggan and Mr. C. E. France gave a talk on mechanised core shops, which was illustrated by a film that has been shown in many towns in Great Britain.

The first film to be shown was that of the re-organised foundry of Messrs. Ruston & Hornsby, Limited, of Lincoln. Mould-drying stoves were shown, together with core-drying stoves illustrating the rack and transveyor system. For its operation a rack slightly under the dimensions of the oven is placed between the core benches. The racks are adjustable to accommodate various sizes and shapes of cores. The core-makers place the plate and finished core on the racks, and when full a boy removes the racks by means of an elevator truck, the truck then being transferred to the oven. After drying, the racks are in many cases used as storage racks in the core shops. By this means batch core-making can be easily and satisfactorily carried out. In each instance the moulds and cores were dried by means of hot air produced from August's forced-draft coke-fired furnace. This film concludes with a general view of the large bay showing the foundry laid out ready for casting. This film was really a very excellent one, and notable was the disposition of the large moulds made with the sandslingers, which were shown all near the centre track leading to the large mould stoves at the end of the bay.

The second film showed the August's Borrmann core-making machine in operation at August's works in Halifax. The whole of the operations of this machine were carefully filmed, and finished cores of a very wide range and intricate shapes were illustrated. Both the large type and small type machines were shown.

The third film was taken at the foundry of the Fullwood Foundry Company, Limited, Mossend, near Glasgow, and depicted the mechanised core-making in connection with the production of ingot moulds, and the ultimate dressing of the moulds after cast. This foundry has been illustrated and described in our columns.*

The final film shown illustrated the Stanton foundry at Holwell, and it first of all gave a general view of the foundry buildings, the melting plant which is situated outside the foundry showing the metal being brought in on low bogies by a locomotive, the moulders pouring, and the conveyor in operation. The atmosphere of this mass-production foundry was remarkable, and was commented upon by many of those present at the lecture. Another interesting feature was the lay-out of the stock yard. Every type of "special" is carefully indicated by a black and white board, and is so laid out that storage, *i.e.*, bringing the pipes in and despatching, can be efficiently and rapidly carried out, without any of the usual difficulties of overlapping in labour control.

At the conclusion an interesting discussion took place, which was opened by Dr. Andrew, who after commenting upon the interesting character of the films, stated that mechanised foundries were in operation abroad more than at home, and it was refreshing to know that their use was being developed in this country. He would like to ask Mr. Coggon what guided him in actually fixing the necessary pressure for filling the core boxes. He believed that Mr. Coggon spoke of a pressure of 80 to 100 lbs. He would also like to know if there was much difference in the bond strength of the cores which were jar-rammed and those made by using compressed air. Were the calculations based on experimental work or on any scientific basis?

Mr. H. F. Coggon said that the question of pressure in the mechanical production of cores had not been gone into very scientifically. They had carried out a great number of practical tests and found that a pressure of 80 to 100 lbs. was necessary to blow a core in any type of sand.

* Foundry Trade Journal, April 21, 1932, page 245.

DISCUSSION.

Dr. J. G. A. Skerl said he was particularly interested in the core stoves. He would like Mr. Coggon to give them some hints as to the best method of drying. One was up against the fact that there was very little data of any importance upon which a foundryman might judge the type of core stoves that suited his purpose the best. They all knew that an oil-sand core should be dried in a stove which should have rather different properties from the ordinary dry-sand moulds and cores, but there were various types of stoves based on certain principles, such as having a high pressure in the stove. There were also some stove systems in which the stoves were exhausted to a pressure lower than the atmosphere. From a purely scientific point of view, there were advantages in both systems, but he would like Mr. Coggon to express an opinion on the matter. Also in the case of drying stoves he would like Mr. Coggon to give some hints as to the design of them—some hints regarding the position of the flues. He took it that the machines Mr. Coggon had dealt with could be used for making moulds apart from cores. The drawback of various types of air-blowing core-making machines had been that inevitably they required a very weak sand for them to be at all efficient, and this weak sand necessitated in all cases that the core should be dried in shells. He would like Mr. Coggon's assurance that in this particular case it was possible to do away with the seeming drawback to the older types of air-compressing and core-blowing machines.

Portable Drying Stoves.

Mr. J. B. Allan said that from the first film it appeared that there were three core stoves, apparently fired by one heater of a portable type. He would like to know if the stoves were under a pressure rather lower than the atmosphere or whether they were under a definite pressure higher than the atmosphere.

Mr. Coggon said with the exhaust system it was difficult to maintain control of temperature in the oven or rapidly to change the atmosphere in the oven. With the pressure system they were able to get a regulated amount of hot air and hot gases and to control their circulation and so maintain a uniform temperature within the stove, subject, of course, to the proper disposition of the exhaust flues. The film illustrations related to a pressure of a 2-in. water gauge. The question of the correct atmosphere or temperature for the drying of cores and moulds was one that had not been dealt with in a thoroughly scientific manner. Especially in the case of oil-sand cores, a very large volume of free oxygen was required. On the three stoves illustrated, one heater supplied the hot air and gases with a common distribution flue at the back of the stoves, and the hot air and gases were independently controlled to each stove so that the temperature and consumption of fuel were regulated in accordance with the type of work, and output required. The question of outlet flue was one in regard to which they had carried out a great deal of experimental work. Originally the hot air was passed through the stove under control through a series of regulated ports. The moisture-laden atmosphere was then exhausted at the front of the stove through one grid at floor level, and two flues with damper control on the side walls, bottom and top. In operation it was found that with heavy mould work the centre position of the stove took much longer in attaining the desired drying temperature and atmosphere, and consequently all the moulds and cores in that position were the last to dry. From the experiments carried out it would appear that with the flues and exhaust arranged as stated above, the hot air passed up the back of the oven, taking the line of least resistance along the roof and direct to the outlet flues at the front of the oven. This left a cloud of steam in the centre of the stove within a few feet of the roof right down to floor level, and the hot air which was passed into the stove was only skirting the fringe of this cool humid area. One or two installations were operated with a completely perforated floor. Underneath the perforated floor, which really formed a false bottom, was one exhaust flue of considerable depth, but otherwise of the same dimensions as the perforated floor, the latter covering the whole area of the oven. Experience in this direction proved that the results were certainly better, but temperature control was more difficult and fuel consumption increased considerably.

Although they tried drying in the oven with damper control, they were unable to hold the heat sufficiently long to ensure the cores or moulds being dry in the morning. Then a perforated flue right to the centre of the stove was used, so that as the heat came in at the back; the centre was exhausted first and the heat travelled at the back uniformly from the bottom of the stove to the top, instead of passing over and leaving the centre cooler and very humid. They found the control in every shape and form much better with the restricted outlet than with the extended one.

Dr. Skerl had raised the question of types of sand which would be produced on the core-making machine. Mr. Coggon said the question of pressure in the mechanical production of cores had not been gone into very scientifically. They had carried out a great number of practical tests and found that a pressure of 80 to 100 lbs. was necessary to blow a core in any type of sand. Up to the present he had not encountered any type of sand that cannot be blown. Also Dr. Skerl had raised the question as to whether they could make moulds as well as cores. Moulds have been successfully produced, but from a production point of view it was not quite satisfactory. He saw no reason why a mould should not be very efficiently produced, but at the moment there were a few difficulties in regard to handling to be overcome in order to get a perfectly satisfactory mould on a production basis.

Vote of Thanks.

Mr. Allen proposed, and Mr. S. Leetch seconded, a vote of thanks to Mr. Coggon. Mr. Letch said he thought the film was one of the greatest advertisements for the rationalisation of foundries he had ever seen. At the same time he felt that although they might go in more for mechanical plant, they must be careful not to spend a great deal of money on such plant and then find they could not use it to its utmost capacity.

Mr. Coggon said that the greatest danger to mechanisation was over-organisation. There had been in this country some outstanding blunders, and those blunders had retarded the full appreciation of what mechanisation could do, not only for the firms producing articles in large numbers, but those who were more or less on semi-jobbing work.

Points raised in the subsequent discussion were answered by Mr. G. E. France, who produced the films.

Core-Blowing Machines.

Mr. J. Roxburgh inquired whether, in regard to core blowing, any difficulties were encountered in venting and the insertion of reinforced wire for strengthening cores. He was interested in the illustration of the ramming-up of an ingot mould core, and wondered if he could be informed as to the maximum size of a core that could be rammed-up by the jolting machine. According to his experience when one reached the

(*Concluded on page* 288.)

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Mechanised Core Shops.

(*Concluded from page* 286.)

range of a 10-ton mould, they found it necessary to break the core, as with a rammed core many difficulties were encountered.

Mr. France said that the size of the core was determined by its weight. There was no reason why a core of perhaps 5 or 6 ft. weighing 40 lbs. could be blown while a core of 1-ft. cube solid could not be blown. Speaking casually and generally, he should say that there was no great difficulty about venting or the insertion of reinforced wire where it was necessary to use them. The cores could be sprigged on. Core blowing had intensified research and development in the direction of avoiding the use of reinforcements and venting wherever possible, and they thought that sand could be composed which to a very large extent avoided the necessity for them. He had no idea of the maximum ingot cast. He knew they made up to a 10-ton size and over, but he could not give any more definite information.

Mr. E. J. Brown asked whether in regard to the ramming of the ingot mould core any difficulty was experienced from difference between the density of the bottom of the core and the top.

Mr. France replied that so far as he knew, while he had never definitely investigated the point, it could not be a very material one, and did not affect the issue to any extent. If there was any variation of density from the top to the bottom it could not seriously affect the efficiency of the product. He had, however, never heard the point discussed.

Mr. Allan observed that in several of the films they had seen sand from the knock-outs being taken away by conveyors of one sort or another. He would like to know what type of conveyor belts was used and whether the material was of steel or some composite material.

Mr. France said that the belts which it was August's practice to use for conveying sand from knock-outs were identical with those used for conveying in other parts. They were standard belts. All August's belts were flat. The question might arise as to why the flat belt was preferred. August's experience was that despite the fact that the draft belt had a greater carrying capacity per foot than a flat belt of the same width, yet the ultimate life of a flat belt was four to five times that of a draft belt, and the carrying capacity of the two belts could be synchronised by increasing the width of the flat belt. The firm started with the draft belt, but eventually adopted the flat belt, and had not found any necessity to depart from that specification.

Speed of Core Making.

Mr. Steel said that there were undoubtedly many points most of them could raise in reference to the blowing of cores. He would like Mr. France to give data as to the cost of the core boxes. He believed it was shown that three operations—one on the machine and two stripping—would produce as many cores as nine that were ordinary operating by hand. He also wondered as to the enormous pressure exerted in blowing the core upon the core boxes themselves. This must of necessity increase the cost of maintenance. Another point was as to what happened in regard to the undercut portions in the core boxes and the air that was already in the core boxes when the sand was blown in, and a vacuum caused with the pressure of the sand. Then in the case of cores weighing between 20 to 50 lbs., surely it was necessary to have reinforcements? He would particularly like to know how they overcome the air that was already in the core boxes to ensure a solid ramming in the undercut portions.

Mr. France said that as a matter of fact the statement on the film that three operations on the machine would produce as much work as nine operated by hand was an absurdly conservative estimate. One particular machine was producing the cores in one-eighth of the time formerly required for the work to be done by hand, and represented a much greater proportion of efficiency than had been suggested by the statement of three to one. In regard to the question of the errosive effect of the sand on the boxes, from information supplied to them they had found that the wear and tear was by no means as excessive as might have been supposed. It had to be remembered that for core blowing on those machines a very definite technique had to be cultivated, and it was found that the technique was primarily attributed to a proper understanding with the release of the air in the core boxes before the core was blown. They had virtually a closed box filled with air and just replaced by the sand from the machine. It followed that, depending upon the uniform efficiency with which that trapped air was released would be the density of the sand forming the core after the core was blown. The technique involved had taken a long time in development, and was by no means perfect, but every day they were discovering more and more about it and were finding that the success of proper air releasing on the core boxes was the criterion by which could be judged the proper production of the cores and also the reduction to a minimum of the errosive effect of the sand on the core boxes.

The Sand Question in Regard to Light-Casting Production.

(*Concluded from page* 264.)

Table III is in reference to the strength of cores after they have been lying on a green-sand mould. It is generally recognised that cores containing molasses or dextrine tend to soften if they lie for any length of time in the mould prior to being cast. It is not generally recognised, however, that oil-sand cores made from nearly every type of binder on the market suffer in this respect and lose appreciable strength. For example, when using linseed oil the transverse strength is reduced about 50 per cent. if a core bonded with this oil is left lying in a green-sand mould for 24 hrs. before being cast. The lesson is to cast the moulds as soon as possible after closing and to keep stock cores in dry storage. A correct baking schedule for cores containing molasses or dextrine plays a large part in minimising this softening or weakening effect, and the aim should be to bake to a dark brown colour. This colour is co-incident with a chemical change taking place in the binders of this class, imparting greater resistance to the action of damp atmospheres. In binders of the true oil class such as linseed, greater latitude can be given to control of stove conditions, without experiencing abnormal strength loss from this cause.

In conclusion it should be remembered that many more workers in this field are needed. So far as knowledge of the sand question in this country is concerned, founders all are more or less just beginners, and personal advice to those interested in this question is to decide on the most valuable and extensive source of information available, buy or construct a testing equipment to conform, or compare with the results shown in that available information, and start where the other fellow left off. In due course, even if one is only interested in the simple control tests of moisture, bond and permeability, it will be found that one's labours have resulted in something very real and valuable. In saying this every practical foundryman is included, for the testing and control of sand is no more technical than the working of it into the castings for which Falkirk is famous. There are many other factors in the light castings industry in which sand plays an important part and which has not been outlined. Perhaps the most important is the relation sand bears to the production of castings which have to be enamelled and the defects of blistering, and in this problem the author recognises his own limitations, and to those who are interested he would refer them to an excellent Paper* by Krynitsky and Harrison.

He would also like to take this opportunity of thanking the directors of Messrs. Glenfield & Kennedy for permission to give this Paper, and in particular Mr. H. Gardner for his interest and co-operation.

To Mr. T. Tyrie he would also extend his appreciation of his excellent work in the preparation of the lantern slides, and last, but not least, to those gentlemen to whose researches he had referred.

Table III.—*Average Transverse Strength of Cores Before and After Placing in Green-sand Moulds.*

Mix No.	Binder.	Before placing in mould, lbs.	After 4 hours in mould, lbs.	After 8 hours in mould, lbs.	After 12 hours in mould, lbs.	After 24 hours in mould, lbs.
1	Raw linseed oil	61	39	37	34	29
2	Powdered rosin	31	29	29	28	26
3	Powdered pitch	12	5	4	4	Less than 3
4	Cereal (from corn)	52	18	13	11	11
5	Wheat flour	19	7	6	4	0
6	Sulfite liquor	55	22	13	8	4
7	Blackstrap molasses	35	0	0	0	0
8	Dextrin	20	10	0	0	0
9	Dextrin and raw linseed oil ..	63	34	12	6	Less than 3

DISCUSSION.

The Chairman (Mr. T. Shanks) said that the author had described all the modern methods of sand examination, and although he himself had thought he was acquainted with most of the modern methods of testing sands, many which had been described by Mr. Hudson were new to him, and he thought to many of those present.

A Member, referring to the figures which had been given showing the reduction which took place in oil-sand cores through being left in a mould, asked whether the hot metal during pouring would reheat the core so as to drive off damp and restore the strength of the core.

Mr. Hudson, in reply, said that he did not think the effect of the metal in the instance given would bring about the restoration of strength of the core. Most binders collapsed under the heat, and in filling the mould the heat came on so quickly that there was no time for a rebaking action of the core. He thought the tendency would be to cause scabs or wash away the core rather than bake it. It was better to rely on casting as quickly as possible after closing the mould. The strength of oil-sand cores was very much in excess of what was necessary, and so gave a foolproof core. Ordinary castings needed only a strength of 5 lbs. per sq. in. in the core, but some years ago he had investigated the question of cores for the spigot end of pipes made by the sand spun process and found that the core required a strength of about 80 lbs. per sq. in. in order to resist the action of the metal which was spun in the mould.

The Chairman said that they had enjoyed Mr. Hudson's Paper, and he asked them to express their appreciation of it and the trouble which its preparation must have involved.

* "Blistering Tendency of some Cast Irons when Enamelled," by Krynitsky and Harrison (Trans. A.F.A., page 332 1930

XUM

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This Week's News in Brief.

Trade Talk.

The L.N.E.R. report that contracts have been placed with various British steel companies for 30,000 tons of steel rails.

The Unitfd Flexible Metallic Tubing Company, Limited, proposes to return to shareholders 4s. for every £1 paid-up share held, it being considered that the issued capital (£212,000) exceeds by at least £42,400 the amount required for the business of the company.

At Dalzell Iron and Steel Works, last week, Mr. Robert Currie, steelworker, slipped while jumping from a wagon at No. 4 melting shop, falling heavily and sustaining a fracture to the ankle. He was attended by the works doctor and later removed to the Royal Infirmary.

Hull City Council has approved a resolution authorising negotiations with National Shipbuilders' Security, Limited, for the purchase of Earle's shipyard. The terms of sale preclude the reopening of the shipyard for shipbuilding; it would be possible to utilise it for engineering purposes.

Contracts amounting to over £250,000 have been placed in connection with the new £3,000,000 steelworks to be built at Corby, Northamptonshire, by Messrs. Stewarts and Lloyds, Limited. The principal contract is for a battery of modern coke ovens and has been placed with the Woodall-Duckham Company.

Messrs. William Denny & Bros., Limited, launched from their Leven shipyard the twin-screw turbine steamer "Brittany" for the Channel Isles to France service of the Southern Railway Company. The vessel is 260 ft. long by 39 ft. broad, and is fitted with two sets of single-reduction gear steam turbines.

British Pigirons, Limited, Abbey House, 2, Victoria Street, London, S.W.1.—Will visitors kindly note that British Pigirons, Limited, have changed their offices to more commodious premises, Rooms 121 and upwards, on the first floor of Abbey House, 2, Victoria Street, London, S.W.1. Telephone numbers, telegraphic addresses and postal addresses remain unaltered.

At the Appleby, Lincolnshire, steelworks of the United Steel Companies, Limited, in the week ended April 8, one steel-melting furnace produced 2,616 tons of steel, compared with the previous record of 2,595 tons established at the same works in the week ended March 18. During the four-weekly period ended April 8, this furnace produced 10,042 tons of molten steel.

A burglary was carried out in the office of the Motherwell Foundry Company, Limited, Shields Road, Motherwell, on Good Friday. The office was entered by removing a panel from the door, and the safe had been blown open by explosives. On account of the Easter holidays, the men had been paid on Thursday instead of Friday, so the burglars only got a few pounds and some insurance stamps, but considerable damage to office books and documents was caused by the explosion and the scattering of the clay which had been used to deaden the sound of the explosion.

The Lackenby Ironworks, Middlesbrough, of Messrs. Pease & Partners, Limited, is being demolished. The plant, which includes three blast furnaces of the single-bell type, eleven stoves, five kilns, etc., and three 140-ft. high brick chimney stacks, was originally built by Messrs. Bolckow Vaughan & Company, Limited, last century. The works were acquired in 1903 by the Tees Furnace Company, and in 1925 were taken over by Messrs. Pease & Partners. The plant has never operated under the present owners' direct control, and the blast furnaces have been idle for the last ten years.

The Burntisland Shipbuilding Company, Limited, launched the coasting steamer "Cedarwood," which they have built for the Joseph Constantine Steamship Line, Limited, Middlesbrough. The "Cedarwood" has a deadweight capacity of 1,300 tons and is 193 ft. in length, 34½ ft. in breadth and has a moulded depth of 15 ft. 1½ in. She has been constructed to the highest class of the British Corporation of Shipping, and conforms with the recently-ratified International Convention Load Line regulations. The propelling machinery will be supplied by the North Eastern Marine Engineering Company, Limited.

Messrs. Harland & Wolff, Limited, Belfast, have secured an order to build two refrigerator motor cargo liners for the Shaw, Savill and Albion fleet. The ships, which will be 500 ft. long and have a deadweight capacity of 12,000 tons and a refrigerating space of 500,000 cub. ft., are intended for fast services between London and New Zealand ports via the Panama Canal. Hull and machinery will be built at Belfast, but there will be manufactured at Messrs. Colvilles, Limited, Dalzell Steel Works, Motherwell, and the Clydebridge Steel Works, Cambuslang, about 12,000 tons of steel required for the construction of the two boats.

Shipping circles on Merseyside were startled last week by news of abnormal sales of liners. During the past few days 33 vessels have changed hands, their tonnage ranging from 11,000 downwards. Three of them are Liverpool steamers, but seven are of the Houlder Fleet, which has been laid up at Milford Haven. They have realised between £27,000 and £28,000, four having been sold for trading and three to the Italians for demolition. Eleven vessels of the Houlder Fleet have now been sold within a few weeks. Japanese ship-breakers have again been active, and have secured the Royal Mail liner "Darro" (11,493 tons), which was built at Belfast in 1912. The Liverpool-Africa liner "Mendian" (3,752 tons), built at Sunderland in 1903, has been sold for £2,800 to be broken up at Blyth.

Personal.

Mr. Charles Stevenson, works manager of the Larbert Art Metal Works, Larbert, was presented with a gold lever watch as a mark of esteem from the staff and workers of the firm and of the associated firm of the Scottish Enamelling Company on the occasion of his leaving the district. Mr. George Flint presided, and Miss Melville made the presentation.

Mr. Arthur James was the recipient of presentations from employees and others recently on his retirement from the position of assistant general manager of Messrs. Baldwins, Limited (Monmouthshire), after 46 years' association with the Panteg Works. In addition to various offices in connection with the sheet trade and the Galvanising Trades Conciliation Board, Mr. James has served on the County Council and other bodies.

Mr. Weldon Hanson, of the research department of Messrs. Dorman, Long & Company, Limited, retired on April 7 after 51 years' service with the firm. Mr. Hanson is President of the Cleveland Institution of Engineers. He commenced as a boy with Messrs. Bell Bros., and became chief chemist to the firm at the age of 21. He has been concerned in various phases of the development of the steel industry of Tees-side, particularly in the making of special steels. Mr. Hanson was the recipient of a presentation at the head offices of the firm recently. The presentation was made by Mr. Arthur Dorman, vice-chairman of the company, who expressed the firm's appreciation of Mr. Hanson's long and able service.

Wills.

Marshall, Robert W., of Sheffield, steel manufacturer	£11,814
Scott, Charles Wood, Bowling, shipbuilder, of Messrs. Scott & Sons, Bowling	£17,965
Reid, Sir John, K.B.E., D.L., Glasgow, chairman of the North British Locomotive Company, Limited	£321,749
Davidson, Andrew, of Linthorpe, Middlesbrough, chief electrical engineer of Messrs. Dorman, Long & Company, Limited	£11,277
Siddall, William Fred, of Sheffield, formerly representative of Messrs. Evered & Company, Limited, brassfounders, of Smethwick	£4,780
Brothers, A., of Eccles, deputy-chairman of Messrs. Platt Bros. & Company, Limited, and a director of Textile Machinery Makers, Limited	£18,381
Smith, Enos, wire manufacturer, founder of Messrs. E. & A. Smith & Company, Limited, now amalgamated with British Ropes, Limited	£113,276
Wiggin, A. H., of Alvechurch, Worcs, formerly a director of Messrs. Henry Wiggin & Company, Limited, nickel refiners, of Birmingham	£91,935

Company Meeting.

Imperial Chemical Industries, Limited.

The annual meeting of Imperial Chemical Industries, Limited, was held in London last week. Sir Harry McGowan (chairman and managing director), who presided, said that the net profits of the year showed an increase of £1,320,782, or 38 per cent. over the preceding year. The improvement was attributable to three factors. The first was the increased volume of business arising from tariff and monetary changes. The second was the realisation of many administrative economies which had been put into effect, and the third was the further progress in the reduction of costs. The company had continued its policy of fully maintaining all plants in a condition of the highest efficiency, as a normal charge against revenue. Further concentrations of manufacture had taken place, notably in the alkali and leather-cloth groups. Similar steps were in progress in the metal group. New capital expenditure during the year upon manufacturing plants had been restricted to those cases where, even in existing depressed conditions, careful estimates of the market, of prices and costs, had justified their embarking upon the venture. So long, however, as world trade showed its present contraction, there was little likelihood of their spending any substantial sum upon new plant and machinery. The only exception related to the hydrogenation of coal into motor spirit. In the building industry they were engaged with the British Steelwork Association in studying the incidence of new products and new methods of construction, on the prospect of replacing unsuitable housing. Rehousing offered, in his opinion, one of the most promising avenues to a large-scale reduction of the unemployment which existed to-day. The new equipment of their metal group had made possible the rolling of zinc on a considerable scale. A growing demand for an explosive for coal mining which would give a bigger yield of round coal had been very successfully met by their new low-density type of explosive. Although the volume of their business in the current year showed in some directions a small comparative fall, he thought, from their experience of the past years of this depression and their knowledge of the present, that they could look hopefully forward to the results of the year 1933 and to the continued prosperity of the company.

Company Reports.

United Flexible Metallic Tubing Company, Limited.—Net profit for 1932, £8,825; brought in, £9,560; interim dividend absorbed £4,240; final dividend of 3 per cent., less tax, making 5 per cent., £6,360; from dividend equalisation fund, £1,000; carried forward, £8,786.

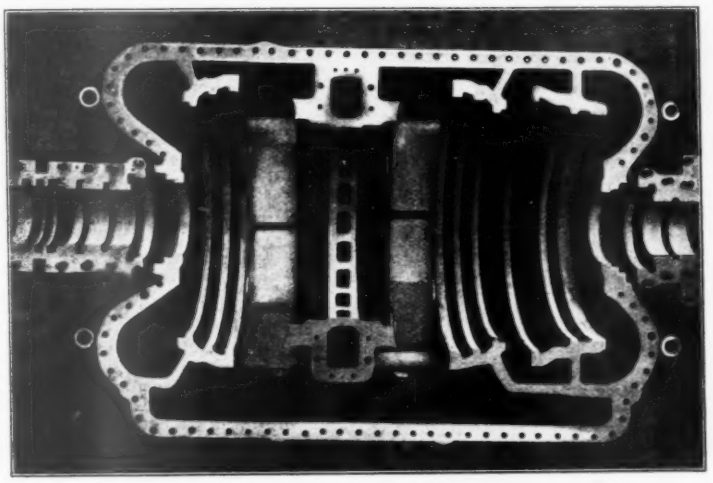
Smith & McLean, Limited.—Loss for 1932, before providing for depreciation, £10,349; brought in, £19,254; carried forward, after payment of preference dividend, £4,218. No distribution is recommended on the ordinary shares. The directors have transferred from ordinary reserve £12,500 to cover depreciation for the year on fixed assets and £1,500 to write down loans and advances to subsidiary companies.

Obituary.

We much regret to record the death of Mr. Alameth Coulthurst, managing director of Messrs. H. J. & A. Coulthurst, Limited, Robert Street Foundry, Darwen, which occurred suddenly on April 15 whilst motoring in Scotland.

Mr. William Tetley Barraclough, managing director of Providence Foundry, Stanningley, died on April 12, after only a fortnight's illness. He was the only son of the late Wm. Barraclough, founder of the firm in 1868. He was well known in the foundry and hardware trades for the firm's production of Yorkshire kitchen ranges.

Mr. Henry Wilson, stated to be the inventor of the gas fire, has died at his home, Abbey Gorse, Kirkstall, Leeds, at the age of 82 years. Mr. Wilson was formerly a director of Messrs. Wilsons & Mathiesons, Limited, Armley, Leeds, one of the largest gas apparatus producing firms in the country. The firm was founded by his father. Mr. Wilson, it is stated, invented the gas fire in 1880.



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Raw Material Markets.

Business in the iron and steel markets has been limited, owing to holiday influences, but otherwise the general situation remains unchanged. Artificial trade barriers continue to hamper exporters, but, in spite of these difficulties, foreign shipments of British iron and steel are showing a slight improvement. The home market, now fairly well protected against uneconomic foreign competition, bears a gratifyingly optimistic aspect. Domestic demands are sufficient to provide employment for the bulk of the plant now in operation.

A feature of the situation is the continued easiness of the scrap market.

Pig-Iron.

MIDDLESBROUGH.—Makers' stocks of iron, which have shown substantial reductions of late, showed a slight increase over the Easter holiday, but there is little danger of the position becoming unwieldy, as there are only two furnaces producing Cleveland foundry pig for the open market at the moment. The local demand remains steady, and heavy tonnages of iron are being shipped to Bo'ness and Grangemouth. The minimum prices are all firmly maintained. To consumers in the Middlesbrough area the delivered prices of Cleveland pig-iron are:—No. 1 foundry grade, 65s.; No. 3 G.M.B., 62s. 6d.; No. 4 foundry and No. 4 forge, 61s. 6d. Owing to the Easter holidays, there was no meeting of the Cleveland iron market on Tuesday.

East Coast hematite is still in strong demand, both in the home and export markets, owing to its low price. For the time being the makers are content to dispose of their output, making an occasional inroad into their considerable stocks. Heavy shipments were made to South Wales and Denmark last week. Makers quote uniform prices both for home deliveries and for export, and average realised figures are 59s. per ton for mixed numbers and 59s. 6d. for No. 1 quality, either f.o.t. or f.o.b.

LANCASHIRE.—The majority of consumers in this district have now resumed work, but there has been no resumption of interest in forward contracts, buying being mainly conducted on a month-to-month basis. No improvement is reported in the consuming trades, although some of the light-castings makers are fairly well employed. The price position shows no change. For delivery to users in the Manchester zone, Midland brands of No. 3 Derbyshire and Staffordshire are on offer at 67s. per ton, with North-East Coast iron nominally at the same figure. Northants at 65s. 6d., Derbyshire forge at 62s., Scottish foundry at around 82s., West Coast hematite at about 80s. 6d. and East Coast hematite at 75s. 6d. Scottish makers report poor sales in the Lancashire district. Offers of competitive Indian iron are now being made at down to 70s. per ton, delivered in the district.

MIDLANDS.—Slightly more movement in the market has been seen since the quarterly meeting at Birmingham, and a fair number of forward contracts has been arranged. The minimum zone rates applicable to Birmingham and the Black Country district are 62s. 6d. for Northants No. 3 and 66s. for Derbyshire, North Staffs and Lincolnshire No. 3. Cleveland makers offer No. 3 iron at the same level as Derbyshire, but this iron is little used in South Staffordshire. Continental foundry iron is uncompetitive. With regard to hematite, prices have a tendency to stiffen. The present price for East Coast iron delivered to this district is 74s. to 77s. 6d. per ton, according to quality and tonnage, and Welsh hematite would be at a similar level. West Coast iron is controlled at 84s. 6d. per ton. In connection with medium- and low-phosphorus iron, for which the demand is increasing for special trades, values differ to a large extent, ranging from about 70s. up to 85s. per ton. Scottish No. 3 is available at about 83s. delivered Birmingham and Black Country stations, and limited quantities of this iron are used.

SCOTLAND.—Business has been very quiet. The one encouraging feature of the market has been the increasing demand for iron from sugar-machinery manufacturers, who are very busy at the moment. There is much idle time in the light-castings trade. There is no alteration in prices for Scottish pig-iron, and the official minimum of 65s. per ton at furnaces for No. 3 foundry is still in force, with 2s. 6d. extra for No. 1. There are seven blast furnaces producing pig-iron and a considerable amount of the output is being put into stock. No. 3 Middlesbrough is quoted at 59s. 9d. at Falkirk and 62s. 9d. at Glasgow, while other English foundry brands are offered at 2s. 3d. below these prices.

Coke.

Conditions in the foundry-coke market are unchanged, hand-to-mouth buying being the general rule. Prices of best Durham coke vary from 36s. 6d. to 38s. 6d. per ton. Welsh grades, according to analysis and tonnage, range from 30s. up to 46s. per ton, delivered in the Birmingham district.

Steel.

The demand for semi-finished steel has improved somewhat. Consumers, who had hitherto been relying upon the Continent for supplies, have had to turn to the home works for material, although the latter have not benefited as much as might have been expected, owing to the limited activity in the consuming industries. As regards finished steel, there has been a better overseas demand, but home consumption fails to show any material activity. The paucity of contracts for structural steel continues to hamper recovery, although rather more activity is to be noticed in the shipbuilding and allied industries. A favourable sign is the greater activity at the rail mills in the North of England.

Scrap.

The falling-off of interest in the scrap-iron markets has been continued, the majority of consumers now being well covered as regards supplies. In the Cleveland district heavy cast iron is nominally quoted at 42s. 6d., machinery quality at 45s. and light castings at 37s. 6d., but it is doubtful whether these prices could be actually obtained. In the Midlands prices are easier, heavy machinery metal being at 45s. to 47s. 6d., heavy pipe and plate scrap at 42s. 6d. and light metal at 37s. 6d., delivered. There is little demand in South Wales for heavy cast iron, which is easier at 44s. Machinery metal is quiet at 48s. to 50s., and light cast metal weaker at 38s. to 39s. In Scotland it is difficult to find buyers for machinery cast-iron scrap at about 50s. per ton, ordinary cast being at 45s. per ton.

Metals.

Copper.—The breathing space of the holiday afforded a chance to review the position in the copper market, and sentiment was not quite so strong on the reopening. The rise in prices was almost entirely due to the rumours of intended production control in America, although it is true that there had been a slight revival of buying by German brass manufacturers. At all events, consumers in this country have been disinclined to follow the rise and are adopting a waiting policy.

Prices have been :—

Cash.—Wednesday, £29 16s. 3d. to £29 18s. 9d.; Thursday, £29 6s. 3d. to £29 7s. 6d.; Tuesday, £29 2s. 6d. to £29 5s.; Wednesday, £29 2s. 6d. to £29 5s.

Three Months.—Wednesday, £30 to £30 1s. 3d.; Thursday, £29 11s. 3d. to £29 12s. 6d.; Tuesday, £29 6s. 3d. to £29 8s. 9d.; Wednesday, £29 7s. 6d. to £29 10s.

Tin.—Quotations have been on the firm side. Messrs. Rudolf Wolff & Company report that "business with consumers in this country has been rather quieter and similar conditions have prevailed on the Continent; in America also there has been some slackening of the activity hitherto reported. The market still presents a firm appearance, there being on the whole rather more disposition to buy, in consequence of which all offerings have been readily absorbed, and as sales have been freely made at the higher levels active conditions have obtained. The rather more favourable reports from America, and the belief that some agreement will be reached between this country and America whereby the general industrial and economic situation will be improved has no doubt contributed to the firm undertone which characterises the market."

Prices of standard tin have been :—

Cash.—Wednesday, £156 10s. to £156 12s. 6d.; Thursday, £156 12s. 6d. to £156 15s.; Tuesday, £157 15s. to £157 17s. 6d.; Wednesday, £158 7s. 6d. to £158 10s.

Three Months. — Wednesday, £157 5s. to £157 7s. 6d.; Thursday, £157 5s. to £157 10s.; Tuesday, £158 10s. to £158 12s. 6d.; Wednesday, £159 to £159 2s. 6d.

Spelter.—This metal has benefited from the more optimistic tone generally prevailing, but the demand from consumers has been somewhat disappointing, in view of the increased volume of inquiries recently circulating.

Price fluctuations :—

Ordinary.—Wednesday, £14 17s. 6d.; Thursday, £14 15s.; Tuesday, £14 15s.; Wednesday, £15 2s. 6d.

Lead.—The actual position on the London market has been somewhat obscured by speculative activity, but it seems that a fairly good business is still being done with consumers in this country. There is little demand from Continental lead manufacturers.

Daily market prices :—

Soft Foreign (Prompt).—Wednesday, £10 7s. 6d.; Thursday, £10 15s.; Tuesday, £11; Wednesday, £11.

Notes from France.—Amongst prominent French foundrymen who have recently had their services recognised by their Government are Mr. E. Ronceray, the president of the French Foundry Technical Association, who has been promoted to "Officer of the Legion of Honour." Mr. Jean Cournot, of the metallurgical department of the Art et Métiers School, has also been promoted to the grade of "Officer." Mr. Arthur Martin, a foundry owner of Revin in the Ardennes, has been created a "Chevalier," as has also Mr. Jacques Fenwick, of the Société Fenwick, foundry equipment manufacturers of Paris.

Mr. Bernard Kent, of the Sterling Manufacturing Company of London, has been elected a member of the Association Technique de Fonderie.

Signor Comm. Jarach has replaced the late Signor Comm. Carlo Vanzetti as a member of the Council of that body.

CAST IRON FLANGED PIPES
2 in.—12 in. & CONNECTIONS. to 24 in. dia.
WE HAVE FIFTY-TWO YEARS OF ACCUMULATED EXPERIENCE AND METAL PATTERNS.
JAMES & RONALD RITCHIE, LTD.,
Telephone: 3852 (2 Lines). MIDDLESBROUGH. Telegrams: "Ritchie, Middlesbrough."

JAS. GRAY & SONS, *Enamelling Engineers,*

Telegrams: "Grayasons, Sowest, London." **5, VICTORIA STREET, LONDON, S.W.1.** Telephone: VICTORIA 5794.

Sole Distributors of:

ESCOL ENAMELS MEET EVERY REQUIREMENT.

ESCOL ENAMELS ENABLE THE PRODUCTION OF HIGHEST QUALITY WARE TO BE OBTAINED WITH A MINIMUM OF OXIDES AND OPACIFIERS.

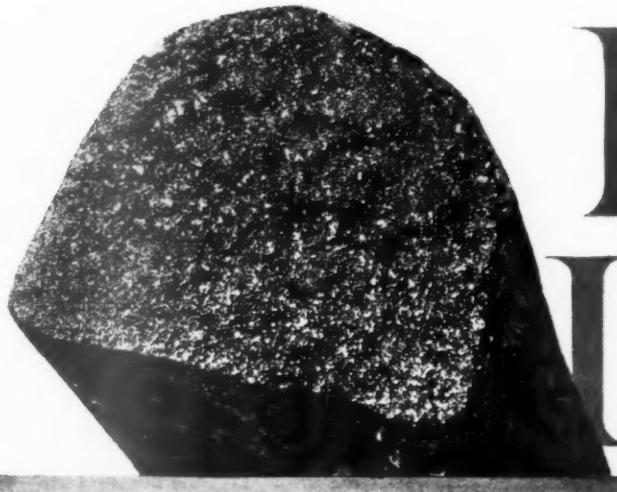
ESCOL ENAMELS ARE GUARANTEED LEADLESS.

ESCOL ENAMELS ARE APPLIED DIRECT TO THE IRON, ENABLING HIGH QUALITY FINISHES TO BE OBTAINED ON THE MOST ECONOMICAL BASIS.

PORCELAIN ENAMELS
FOR
CAST IRON AND SHEET METAL.

If you are considering the enamelling of your product—If you are at present engaged in enamelling—
WE CAN BE OF ASSISTANCE TO YOU.

Manufacturers: J. F. Stewart & Co., Ltd., Paisley Works, London, E.15.



PIG IRON

Manufacturers of FOUNDRY, BASIC and HEMATITE qualities. Delivery from stock.
Booklet giving analyses, etc., will be sent on request.

DORMAN LONG & CO. LTD., MIDDLESBROUGH

DORMAN LONG

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	29	2	6
Three months	29	7	6
Electrolytic	33	10	0
Tough	31	0	0
Best selected	31	10	0
Sheets	61	0	0
India	41	15	0
Wire bars	34	10	0
Do., May	34	2	6
Do., June	34	0	0
Ingot bars	34	10	0
H.C. wire rods	36	15	0
Off. av. cash, March	28	4	4 19/20
Do., 3 mths., March	28	9	10 2/3
Do., Sttlmnt., March	28	4	2 17/20
Do., Electro, March	32	13	3 9/20
Do., B.S., March	31	0	3 1/5
Do., wire bars, March	32	17	2 3/5
Solid drawn tubes			9½d.
Brazed tubes			9½d.
Wire			6½d.

BRASS.

Solid drawn tubes	8¾d.
Brazed tubes	10¼d.
Rods, drawn	7¾d.
Rods, extd. or rlld.	4¾d.
Sheets to 10 w.g.	7¼d.
Wire	7¾d.
Rolled metal	7d.
Yellow metal rods	4¼d.
Do. 4 × 4 Squares	5¼d.
Do. 4 × 3 Sheets	5¼d.

TIN.

	£	s.	d.
Standard cash	158	7	6
Three months	159	0	0
English	159	12	6
Bars	161	10	0
Straits	164	0	0
Australian	161	15	0
Eastern	165	0	0
Banca	164	15	0
Off. av. cash, March	149	4	1 13/20
Do., 3 mths., March	149	18	1 1/20
Do., Sttlmt., March	149	4	1 13/20

SPELTER.

	£	s.	d.
Ordinary	15	2	6
Remelted	14	5	0
Hard	12	5	0
Electro 99.9	17	10	0
English	15	12	6
India	14	0	0
Zinc dust	19	0	0
Zinc ashes	2	5	0
Off. aver., March	14	13	2 11/20
Aver. spot, March	14	12	11 5/20

LEAD.

	£	s.	d.
Soft foreign ppt.	11	0	0
Empire	11	5	0
English	12	10	0
Off. average, March	10	14	3 1/20
Average spot, March	10	12	2 3/20

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	24	0	0
Do., V.M. ex-whse.	23	5	0
Rods	26	0	0
Boiler plates	22	0	0
Battery plates		—	

ANTIMONY.

English	37 10 0 to 42	10	0
Chinese	26	10	0
Crude		—	

QUICKSILVER.

Quicksilver	9	0	0 to	9	12	6

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro silicon—	
25%	£7 15 0
45/50%	£13 17 6
75%	£19 12 6
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% carbon-free of Mo.	6/3 per lb.
Ferro-titanium—	
23/25% carbon-free	10d. lb.
Ferro-phosphorus, 20/25%	£17 17 6
Ferro-tungsten—	
80/85%	1/7½ lb.
Tungsten metal powder—	
98/99%	1/10½ lb.
Ferro-chrome—	
2/4% car.	£29 5 0
4/6% car.	£22 15 0
6/8% car.	£21 15 0
8/10% car.	£21 0 0
Ferro-chrome—	
Max. 2% car.	£34 10 0
Max. 1% car.	£36 5 0
Max. 0.70% car.	£40 2 6
70%, carbon-free	11d. lb.
Nickel—99.5/100%	£240 to £245
"F" nickel shot	£216 0 0
Ferro-cobalt	7/3 lb.
Aluminium 98/99%	£100 0 0
Metallic chromium—	
96/98%	2/8 lb.
Ferro-manganese (net)—	
76/80% loose	£10 15 0 to £11 5 0
76/80% packed	£11 15 0 to £12 5 0
76/80% export (nom.)	£9 15 0
Metallic manganese—	
94/96% carbon-free	1/4 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	2s. 0d.
Finished bars, 18% tungsten	2s. 9d.

Per lb. net, d/d buyers' works.

Extras—	
Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 5/16 in.	1/– lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅜ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/– lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP.

	£	s.	d.		£	s.	d.
South Wales—							
Heavy steel	2	3	6	to	2	5	0
Bundled steel and shrngs.	1	17	6	to	2	1	6
Mixed iron and steel	1	19	0	to	2	1	0
Heavy cast iron					2	4	0
Good machinery	2	8	0	to	2	10	0
Cleveland—							
Heavy steel					1	17	6
Steel turnings					1	11	6
Cast-iron borings					1	2	0
Heavy forge					2	10	0
W.I. piling scrap					2	2	6
Cast-iron scrap	2	2	6	to	2	5	0
Midlands—							
Light cast-iron scrap					1	17	6
Heavy wrought iron					2	7	6
Steel turnings, f.o.r.					1	4	6
Scotland—							
Heavy steel	1	17	6	to	1	18	9
Ordinary cast iron					2	5	0
Engineers' turnings					1	11	6
Cast-iron borings					1	12	6
Wrought-iron piling					2	5	0
Heavy machinery					2	10	0

London—Merchants' buying prices, delivered yard.

	£	s.	d.
Copper (clean)	21	0	0
Brass	16	0	0
Lead (less usual draft)	9	10	0
Tea lead	8	0	0
Zinc	9	0	0
New aluminium cuttings	74	0	0
Braziery copper	19	0	0
Gunmetal	18	0	0
Hollow pewter	80	0	0
Shaped black pewter	60	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast (d/d Tees-side area)—	
Foundry No. 1	65/–
Foundry No. 3	62/6
,, at Falkirk	59/9
,, at Glasgow	62/9
Foundry No. 4	61/6
Forge No. 4	61/6
Hematite No. 1, f.o.t.	59/6
Hematite M/Nos., f.o.t.	59/–
N.W. Coast—	
Hem. M/Nos. d/d Glas.	68/6
,, d/d Birm.	84/6
Malleable iron d/d Birm.	115/–
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	62/–
,, No. 3 fdry.	66/–
Northants forge	58/6
,, fdry. No. 3	62/6
,, fdry No. 1	65/6
Derbyshire forge	62/–
,, fdry. No. 3	66/–
,, fdry. No. 1	69/–
Scotland—	
Foundry No. 1	67/6
,, No. 3	65/–
Hem. M/Nos. d/d	66/–
Sheffield (d/d district)—	
Derby forge	59/6
,, fdry. No. 3	63/6
Lincs forge	59/6
,, fdry. No. 3	63/6
E.C. hematite	75/6
W.C. hematite	83/6
Lancashire (d/d eq. Man.)—	
Derby fdry. No. 3	67/–
Staffs fdry. No. 3	67/–
Northants fdry. No. 3	65/6
Cleveland fdry. No. 3	67/–
Dalzell, No. 3 (special)	102/6 to 105/–
Glengarnock, No. 3	82/–
Clyde, No. 3	82/–
Monkland, No. 3	82/–
Summerlee, No. 3	82/–
Eglinton, No. 3	82/–
Gartsherrie, No. 3	82/–
Shotts, No. 3	82/–

FINISHED IRON AND STEEL.

Usual district deliveries for iron; delivered consumer's station for steel.

Iron—	£	s.	d.		£	s.	d.
Bars (cr.)	9	0	0	to	9	15	0
Nut and bolt iron	7	10	0	to	8	0	0
Hoops	10	10	0	to	12	0	0
Marked bars (Staffs) f.o.t.					12	0	0
Gas strip	10	10	0	to	12	0	0
Bolts and nuts, ¾ in. × 4 in.					12	15	0
Steel—							
Plates, ship, etc.	8	15	0	to	8	17	6
Boiler plts.	8	0	0	to	9	0	0
Chequer plts.					10	7	6
Angles					8	7	6
Tees					9	7	6
Joists					8	15	0
Rounds and squares, 3 in. to 5½ in.					9	7	6
Rounds under 3 in. to ⅜ in. (Untested)					6	15	0 & up.
Flats—8 in. wide and over					8	12	6
,, under 8 in. and over 5 in.					8	17	6
Rails, heavy	8	5	0	to	8	10	0
Fishplates					12	0	0
Hoops (Staffs)					9	10	0 & up.
Black sheets, 24g. (10-t. lots)					9	10	0
Galv. cor. shts.	,,				11	15	0
Galv. flat shts.	,,				12	5	0
Galv. fencing wire, 8g. plain					14	0	0
Billets, soft	5	0	0	to	5	7	6
Billets, hard	6	12	6	to	7	2	6
Sheet bars	4	15	0	to	5	2	6
Tin bars					4	15	0

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	10¼d.
Sheet to 10 w.g.	11¼d.
Wire	11¾d.
Rods	10¼d.
Tubes	15d.
Castings	12½d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	14.34
No. 2 foundry, Valley	14.50
No. 2 foundry, Birm.	11.00
Basic	15.39
Bessemer	16.89
Malleable	16.39
Grey forge	16.39
Ferro-mang. 80%, seaboard	68.00
O.-h. rails, h'y, at mill	40.00
Billets	26.00
Sheet bars	26.00
Wire rods	35.00
	Cents.
Iron bars, Phila.	1.86
Steel bars	1.60
Tank plates	1.60
Beams, etc.	1.60
Skelp, grooved steel	1.60
Steel hoops	1.55
Sheets, black, No. 24	2.00
Sheets, galv., No. 24	2.60
Wire nails	1.85
Plain wire	2.10
Barbed wire, galv.	2.35
Tinplates, 100-lb. box	$4.25

COKE (at ovens).

Welsh foundry	20/– to 22/6
,, furnace	16/– to 17/–
Durham and Northumberland—	
,, foundry	21/– to 25/–
,, furnace	13/3
Midlands, foundry	—
,, furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box		15/6 to 16/–
,,	28×20	,,	31/– to 32/–
,,	20×10	,,	22/3 to 22/9
,,	18¾×14	,,	16/1½ to 16/4½
C.W.	20×14	,,	14/9
,,	28×20	,,	30/3
,,	20×10	,,	22/–
,,	18¾×14	,,	15/10½

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6	0	0	to	£7	0	0
Bars-hammered, basis	£16	10	0	to	£17	0	0
Bars and nail-rods, rolled, basis	£15	17	6	to	£16	5	0
Blooms	£10	0	0	to	£12	0	0
Keg steel	£32	0	0	to	£33	0	0
Faggot steel	£18	0	0	to	£23	0	0
Bars and rods dead soft, st'l	£10	0	0	to	£12	0	0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS.

Standard Copper (cash).

		£	s.	d.		
April	12 ..	29	16	3	dec.	3/9
,,	13 ..	29	6	3	,,	10/–
,,	18 ..	29	2	6	,,	3/9
,,	19 ..	29	2	6	No change	

Electrolytic Copper.

		£	s.	d.		
April	12 ..	34	5	0	dec.	10/–
,,	13 ..	33	10	0	,,	15/–
,,	18 ..	33	5	0	,,	5/–
,,	19 ..	33	10	0	inc.	5/–

Standard Tin (cash).

		£	s.	d.		
April	12 ..	156	10	0	inc.	2/6
,,	13 ..	156	12	6	,,	2/6
,,	18 ..	157	15	0	,,	22/6
,,	19 ..	158	7	6	,,	12/6

Tin (English ingots).

		£	s.	d.		
April	12 ..	157	15	0	No change	
,,	13 ..	158	0	0	inc.	5/–
,,	18 ..	159	0	0	,,	20/–
,,	19 ..	159	12	6	,,	12/6

Spelter (ordinary).

		£	s.	d.		
April	12 ..	14	17	6	No change	
,,	13 ..	14	15	0	dec.	2/6
,,	18 ..	14	15	0	No change	
,,	19 ..	15	2	6	inc.	7/6

Spelter (Electro, 99.9 per cent.).

		£	s.	d.		
April	12 ..	17	10	0	dec.	5/–
,,	13 ..	17	5	0	,,	5/–
,,	18 ..	17	5	0	No change	
,,	19 ..	17	10	0	inc.	5/–

Zinc Sheets (English).

		£	s.	d.		
April	12 ..	24	0	0	No change	
,,	13 ..	24	0	0	,,	,,
,,	18 ..	24	0	0	,,	,,
,,	19 ..	24	0	0	,,	,,

Lead (English).

		£	s.	d.		
April	12 ..	12	10	0	No change	
,,	13 ..	12	5	0	dec.	5/–
,,	18 ..	12	10	0	inc.	5/–
,,	19 ..	12	10	0	No change	

AVERAGE MONTHLY PRICES OF UNMARKED BARS (SOUTH STAFFS).

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1899	6 10 0	6 15 0	6 15 0	6 15 0	7 0 0	7 0 0	7 10 0	7 10 0	8 10 0	9 0 0	9 0 0	9 10 0	7 12 11
1900	10 0 0	10 10 0	10 10 0	10 10 0	10 15 0	10 15 0	10 5 0	10 5 0	10 5 0	9 10 0	8 15 0	8 15 0	10 1 3
1901	8 0 0	7 10 0	7 5 0	7 0 0	6 10 0	6 10 0	6 10 0	6 10 0	6 15 0	6 15 0	6 15 0	6 15 0	6 17 11
1902	7 0 0	6 10 0	6 15 0	6 15 0	6 15 0	6 10 0	6 10 0	6 15 0	6 15 0	6 15 0	6 10 0	6 10 0	6 13 4
1903	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 7 0	6 5 0	6 9 4
1904	6 5 0	6 5 0	6 5 0	6 5 0	6 10 0	6 5 0	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0	6 2 11
1905	6 5 0	6 5 0	6 0 0	5 17 6	5 15 0	5 15 0	5 15 0	5 15 0	6 0 0	6 5 0	6 15 0	6 15 0	6 1 10½
1906	7 0 0	7 5 0	7 5 0	7 5 0	6 17 6	6 15 0	6 12 6	6 10 0	6 10 0	6 12 6	6 16 3	7 3 9	6 17 8½
1907	7 3 9	7 5 0	7 5 0	7 5 0	7 5 0	7 7 6	7 5 0	7 7 6	7 7 6	7 7 6	7 7 6	7 5 0	7 5 11
1908	7 2 6	7 0 0	7 0 0	7 0 0	6 15 0	6 7 6	6 5 0	6 2 6	6 2 6	6 2 6	6 2 6	6 0 0	6 10 0
1909	6 0 0	6 0 0	6 0 0	5 17 6	6 0 0	6 0 0	6 0 0	5 17 6	6 0 0	6 2 6	6 2 6	5 17 6	5 19 9½
1910	6 2 6	6 3 4½	6 7 6	6 7 6	6 7 6	6 7 6	6 6 6	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 7
1911	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 10 0	6 12 6	6 16 6	6 7 0
1912	6 18 9	7 1 10	7 2 6	7 8 9	7 18 0	8 0 7	8 2 6	8 3 6	8 5 0	8 6 3	8 7 6	8 8 9	7 17 0
1913	8 11 6	8 10 7½	8 10 0	8 8 1½	8 2 0	8 0 0	7 17 6	7 11 6	7 8 9	7 5 6	6 18 1½	6 17 6	7 16 9
1914	6 17 6	6 15 7½	6 12 6	6 10 0	6 10 0	6 10 0	6 10 0	7 11 10½	8 0 0	7 12 6	7 5 7½	7 6 3	7 1 0
1915	7 11 6	8 5 11	8 8 9	9 6 0	10 3 2	10 19 2	11 12 6	11 13 1½	11 13 9	11 14 3	12 1 10½	13 0 9	10 6 0
1916	13 7 6	13 10 8	13 12 9½	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 3 9½
1917	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0
1918	13 15 0	13 17 3	13 17 6	13 17 6	13 17 6	13 17 6	13 17 6	14 15 0	14 15 0	14 15 0	14 15 0	14 15 0	14 4 5½
1919	15 10 0	16 5 0	17 15 0	17 15 0	20 15 0	21 0 0	21 0 0	22 0 0	22 0 0	22 0 0	22 7 6	22 12 6	20 1 8
1920	24 7 6	24 10 0	25 10 0	27 10 0	29 5 0	31 0 0	31 10 0	31 10 0	31 10 0	31 10 0	31 10 0	29 7 6	29 1 8
1921	26 17 3	25 0 0	23 0 0	21 0 0	19 0 0	18 5 0	16 0 0	16 0 0	15 14 0	14 0 0	13 6 8	13 0 0	19 4 5
1922	13 0 0	12 3 9	11 14 0	11 11 10½	11 5 0	11 3 6	11 2 6	11 5 0	10 17 2½	10 16 3	10 13 0	10 12 6	11 7 0½
1923	10 16 10½	11 3 1½	12 2 6	12 8 9	12 11 6	12 1 3	11 15 11½	11 15 0	11 15 0	11 15 0	12 13 6	12 8 3	11 18 10½
1924	12 9 6	12 10 0	12 10 0	12 15 7½	12 17 6	12 17 6	12 17 6	12 17 6	12 17 6	12 14 0	12 12 6	12 12 6	12 14 8½
1925	12 12 6	12 12 6	12 12 6	12 12 6	12 12 6	12 7 6	12 7 6	12 7 6	12 4 6	11 18 6	11 13 9	11 13 0	12 6 2½
1926	11 7 9½	11 5 0	11 5 0	11 5 0	11 3 9	11 3 9	11 5 0	12 0 0	13 0 0	*	15 7 6	12 19 0	12 0 2
1927	12 6 3	12 2 6	11 14 0	11 0 0	10 18 9	10 13 6	10 12 6	10 5 0	9 16 0	9 15 0	9 13 9	9 12 9	10 14 2
1928	9 12 6	9 12 6	9 11 0	9 10 0	9 8 4	9 5 0	9 5 0	9 5 0	9 5 0	9 5 0	9 3 6	9 1 3	9 7 0
1929	9 0 0	9 2 6	9 5 7½	9 9 4½	9 10 0	9 17 6	10 2 6	10 2 6	10 2 6	10 0 6	10 3 9	10 5 7	9 15 2½
1930	10 7 6	10 7 6	10 7 6	10 6 10½	10 6 3	10 5 0	10 2 6	10 2 6	10 2 6	10 2 6	10 2 6	10 4 7½	
1931	10 2 6	10 0 0	10 0 0	10 0 0	9 18 1½	9 17 6	9 17 6	9 17 6	9 17 6	9 17 6	9 17 6	9 16 10½	9 18 0½
1932	9 15 0	9 15 0	9 15 0	9 15 0	9 13 9	9 11 3	9 10 0	9 10 0	9 10 0	9 6 3	9 5 0	9 5 0	9 10 11½
1933	9 5 0	9 5 0	9 5 0	—	—	—	—	—	—	—	—	—	—

* No quotation available owing to strike.

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